PERINATAL DETERMINANTS
OF
CHILD SURVIVAL

Proceedings of a workshop which was conducted in New Delhi, India
February 20-23, 1989

Indian Council of Medical Research
New Delhi.

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PERINATAL DETERMINANTS OF CHILD SURVIVAL

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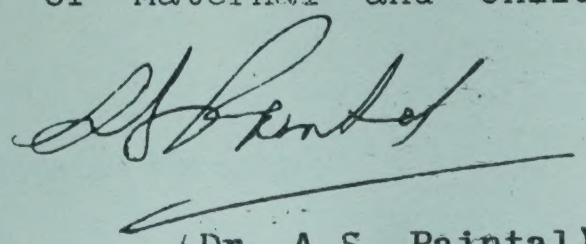
FOREWORD

The trends of Perinatal and Neonatal Mortality in India has hardly shown any change during last 15 years. The problem of maternal and neonatal mortality have been that large proportion of factors for maternal and neonatal mortality which contribute to an adverse outcome of pregnancy can be prevented by improving perinatal and neonatal health care delivery system, reinforced by training of the medical and paramedical personnel on need based tasks and use of appropriate technology.

The gap between what is expected to be provided for mothers and infant care and what is available is very wide. The main question is can something be done to improve the current situation for infant and child survival. In order to understand the current state of art of perinatal and neonatal determinants of child survival, a workshop was organised in collaboration with NICHD, Bethesda at ICMR New Delhi in February 1989.

It is hoped that proceedings of this workshop and recommendations made will be useful to the programme planners and managers at different levels for improving the delivery and utilisation of Maternal and Child Health Services.



(Dr. A.S. Paintal)
Director General
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INTRODUCTION

Perinatal infant mortality rates are good indicators of the general health status of a population and also reflect its socioeconomic status. Perinatal mortality is related more to the health of the mother, her nutritional status as well as the medical care which she has received during pregnancy and around labor and delivery, whereas postneonatal mortality is more reflective of the environment in which the child is reared.

The gaps between different countries of this world in their infant mortality rates are immense. Countries like Japan, Finland and Sweden and others have rates of infant mortality which are less than 10 per 1000 whereas countries in the developing world in parts of Africa and Asia have rates exceeding 120 per 1000. Similar gaps exist between developed and developing countries in their maternal mortality rates. Maternal mortality rates in developed countries may be as low as 5-10 per 100,000 and in developing countries as high as 600-800 per 100,000.

India, with a birth rate of around 33 per 1000, has a maternal mortality rate of 4-7 per 1000 livebirths and an infant mortality rate of 90 per 1000. India also has a high incidence of low birth weight of around 25-35%. There are considerable differences among the states of India in infant mortality rates which range from a low of about 35 per 1000 in the state of Kerala to 160 per 1000 in the state of Utter Pradash. Infant mortality also differ among women who differ in their educational level within states. Generally infants of mothers who have no education face twice the probability of dying during the first year of life than infants of educated mothers.

It is well known that almost 80% of the births in India take place outside the institutions, namely in the homes. The care of pregnant mothers is provided largely by family members or by traditional birth attendants who are part of the community and who have practiced the art of childbirth as a family profession for centuries. The potential benefit of primary care provided by a trained female health worker for the community has only touched as yet a small fraction of the population. Even the currently available facilities at the maternal and child welfare centers, taluk, district and urban hospitals have been used only sparingly and then only for delivery and not for comprehensive perinatal care. The lack of availability of maternal and child health services and where available the lack of utilization of such services in most areas of India are thought by many to be key factors in the persistent high perinatal and infant mortality rate.

The current trends in perinatal and infant mortality represent important challenges to public policy and to the health care system. There is agreement that prenatal care, if properly structured and effectively utilized, is an effective intervention and is associated with a measurable improvement in birth outcome. In addition, the evidence available suggests that prenatal care is especially important for women who are at increased social and medical risk.

This workshop evolved from discussions between Dr. Badri Saxena, the Deputy Director of the ICMR and Dr. Berendes from the National Institute of Child Health and Human Development and was approved by the Indo-U.S. Subcommission at their meeting in New Delhi in 1987.

In planning the workshop, it was our intent to present comprehensive summaries of different major topics relevant to the issue of child survival and maternal mortality and to cover in these presentations the specific perspective as seen from the point of view of India as well as other developing countries with experiences which are relevant to India. Invited speakers were encouraged to review the topic of their assignment from a public health perspective and highlight those which offer opportunities for intervention. The coverage of a given topic, therefore, is not necessarily all inclusive but represents the point of view of the speaker. These formal presentations were to set the stage for the second part of the workshop which was to consist of work group sessions providing for a free exchange of ideas designed to identify and develop specific interventions to address infant and maternal mortality which are thought to be appropriate for India.

Participants were selected by the ICMR to present various government and academic institutions in India and by the NIH to represent the academic community in the United States, the Centers for Disease Control, the World Health Organization, and the National Institute of Child Health and Human Development, National Institutes of Health.

The workshop took place in New Delhi from February 20-23, 1989 at the Indian Council for Medical Research.

Topics addressed by the workshop included:

1. Trends in infant mortality with particular emphasis to developing countries as well as India.

2. Trends in maternal mortality.

3. Maternal nutritional factors related to infant mortality.

4. Pre- and perinatal infections and infant mortality.

5. Determinants of perinatal, neonatal and postneonatal mortality.

6. Social and cultural determinants of infant mortality.

7. The risk approach to basic maternal and child health care.

8. Appropriate technology for maternal and infant care.

9. Training of health personnel as an intervention for improving maternal and child health/family planning services.

10. Community participation for better utilization of maternal and child health/family planning services.

11. Delivery of maternal and child health/family planning services at the subcenter.

After the formal presentations the participants were assigned to two discussion groups--one addressing interventions during the prenatal period focusing

predominately on the pregnant woman and the delivery of her child and the other work group emphasizing interventions dealing with the newborn and the first year of life. The two discussion groups developed numerous recommendations which were then presented to all participants for their approval.

WORKSHOP RECOMMENDATIONS

In this meeting, several distinguished participants from India identified by the ICMR, New Delhi, as well as some foreign participants identified by the U.S. National Institute of Child Health and Human Development, Bethesda, Maryland, participated. This workshop was recommended by the Indo-U.S. subcommission meeting held at New Delhi in 1987 and was held from February 20-23, 1989 as approved by the Ministry of Health & Family Welfare, Government of India, New Delhi. The background documents consisted of papers on identified topics by some of the speakers as indicated in the enclosed agenda. The lead discussants were also requested to give a brief summary of their presentation in a write up form which would be included in the publication of this workshop.

Professor A.S. Paintal, Director-General, ICMR joined the meeting in the concluding session on 23rd February 1989 when the recommendations as an outcome of this workshop were discussed and presented to the participants. A general consensus was obtained on several recommendations which could be considered for immediate implementation by the Programme Managers as well as to identify both short term and medium term research programmes and future mechanisms of continuing Indo-U.S. collaboration in the field of maternal and child health. These are indicated below.

(a) <u>RECOMMENDATIONS FOR IMMEDIATE IMPLEMENTATION BY PROGRAMME MANAGERS:</u>

1. Integration of MCH and FP services at all levels but particularly for the village health workers. While goals are necessary to monitor the performance, the health care delivery system and particularly the peripheral health functionaries, should not achieve the targets only in the numerical sense. Equal emphasis should be laid on family planning, as well as on the maternal and child health goals, e.g., increase antenatal registration, raising the frequency and quality of minimal antenatal services, safe delivery procedures, complete immunization, rehydration therapy for diarrhea and adequate facilities for referral and transport. Though some participants recommended that the family planning targets should not be laid down for peripheral workers, rather the FP services should be available to the community on demand, there was no general consensus in this recommendation.

2. Strengthening of evaluation and monitoring to give support and feedback for maintaining high levels of coverage as well as quality of care.

3. Deficiencies, e.g., in manpower and equipment, as identified by the ICMR study on "Quality evaluation at PHCs and subcentres" should be corrected and rectified.

4. Training and reorientation of various categories of health functionaries on managerial, supervisory and technical aspects of MCH and FP services need to be strengthened at all levels.

5. Government may consider to rejuvenate Village Health Guide scheme, preferably with the female worker, to act as bridges between the community and the health care system.

6. Training on MCH care including epidemiology and other aspects of public health, including health economics, needs to be emphasized in undergraduate and post-graduate medical education, especially of medical officers attending Health Family Welfare Training Centres.

7. Relevant professional journals and learning resource material including current research findings should be made available at primary health centres.

8. Currently available health education material as well as material which would enhance community participation and awareness should be more aggressively utilized.

9. Government could consider opening a National Center for Research in Maternal and Child Health, whose major responsibility would be to do the necessary R&D for improving the national programmes related to maternal and child health. In addition, Government may also consider strengthening the community medicine discipline in the country.

(b) RESEARCH PROJECTS THAT COULD BE CARRIED OUT IN 1-2 YEARS TIME

1. Research studies which would help to improve accountability at all levels of the health system including redefinition and study of the role perceptions and performance of health functionaries.

2. Development of minimum standards for MCH care at different levels and studying the effectiveness of appropriate technologies emperically.

3. Study the effectiveness of decentralization of tasks and decisions to the peripheral health workers in order to improve the outreach and quality of MCH/FP services. As an example, an ongoing ICMR study of Comprehensive MCH Care is assessing the effect of exempting the eight study blocks from targets fulfilment.

4. Research leading to better ways of measuring rates of birth and deaths especially maternal deaths and child deaths after 5 years of age.

5. Develop and standardize tools to assess the cause of death through post-mortem interview (verbal autopsy).

6. Operations research which would improve the frequency of weighing of the babies under the field conditions concurrent with the development of technique for management of low birth weight infants. Along with this, other community based studies which would help to reduce the rates of low birth weight infants need also to be undertaken.

7. Develop MCH training modules and testing the effectiveness.

(c) RESEARCH PROJECTS WHICH WOULD TAKE MORE THAN 2 YEARS TO COMPLETE:

1. To develop better Management Information System for MCH Programmes.

2. To assess the efficacy, including the cost effectiveness, of

programmes like ORT, immunization and acute respiratory infections and treatment of a combination of these interventions.

3. To study the alternative approaches for implementing anemia prophylaxis programme.

4. Studies to improve the use of ORT, e.g., use of cereal based solution.

5. To identify why the community is not utilizing services and identify ways to increase community participation.

6. Studies to improve the functioning of the subcentre. This should include what drugs should be available for MCH care and what equipment should be present at all subcentres.

(d) PROPOSED MECHANISMS FOR INDO-U.S. COLLABORATION IN MCH

1. Establish a "Working Group for Maternal and Child Health Research" with experts from India and U.S. under aegis of ICMR New Delhi and NICHD, U.S.A. This working group could meet at 12 to 18 month intervals alternatively in India or U.S. to review the progress of ongoing collaboration and make necessary recommendations for future collaboration. These recommendations would then be submitted for approval by the Indo-U.S. subcommission, as in the current practice for all Indo-U.S. collaborations in the field of science and technology.

2. U.S. may attempt to provide necessary training grants to middle and young level Indian scientists in the fields of health economics, health administration, epidemiology and other related disciplines. In addition, certain Indo-U.S. workshops and training courses may be planned with a joint Indo-U.S. faculty on different aspects of maternal and child health.

In the concluding remarks, Professor Paintal and Dr. Berendes, while expressing general agreement with the above recommendations, stressed the need of immediate implementation of weighing of newborn infants under the field conditions and the urgent need for doing necessary R&D for improving the management of low birth weight infants under the field conditions.

Maternal and Infant Mortality: A Global Overview

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INTRODUCTION

The health of women and children forms a continuum from one generation to another. It reflects not only the vulnerabilities inherent in the biological and behavioral aspects of reproduction, growth, development and maturation but also the social, ecological and historical situation of societies. The successful and healthy transition from one critical stage of life to the next is enhanced in societies that have made a commitment to social justice and provide a minimum level and appropriate distribution of resources for health and social development. The health of women and children is threatened by imbalance in the women and illiteracy. Social changes, such as discrimination against economic crises, and natural and man-made disasters all leave an imprint on the health of women and children.

Women's life long health can be compromised by discriminatory treatment in childhood. Traditionally many cultures prefer male children. Sons are perceived as an economic asset to the family, contributing productive labor. Girls on the other hand are seen as a burden who often have to be provided with a costly dowry and whose economic productivity will benefit their husband's family rather than that of their parents. Sons usually have the main responsibility for the care of their parents in old age. Girls may get less food, be sicker before they are taken for curative health care, and receive less preventive health care. Evidence of such practices include poorer nutritional status of girls than boys, fewer girls than boys immunized, higher case fatality among girls brought to hospital, and higher mortality overall. (Table 1) Significantly where women's economic productivity is high, the preference for sons is less pronounced.

Women's education is also an important determinant of their own health and that of their children. In every economic setting the children of literate women have a better chance of survival than those of illiterate women. Educated women tend to marry later, delay the onset of childbearing and are more likely to practice family planning. They generally have fewer children with a wider spacing between births. Women with no schooling on average have almost twice as many children as those with seven or more years schooling.[1]

TABLE 1
Infant, Toddler and Child Mortality Rate, Ratios (M/F)
and Preference for Sex of Children

Country	Infant	Toddler	Child	Preference
Senegal	1.16	0.99	1.00	1.5
Nepal	1.03	0.89	0.95	4.0
Bangladesh	1.03	0.73	0.84	3.3
Pakistan	1.05	0.63	0.68	4.9
Cameroon	1.07	1.04	0.99	1.2
Egypt	1.01	0.71	0.94	1.5
Turkey	1.10	0.62	0.94	1.4
Ivory Coast	1.24	1.19	1.11	1.2
Indonesia	1.30	1.15	1.31	1.1
Morocco	1.06	0.88	1.11	1.2
Kenya	1.10	1.17	1.02	1.1
Ghana	1.22	1.15	0.95	1.0
Columbia	1.19	0.75	0.83	1.0
Tunisia	1.02	1.05	1.25	1.3
Mexico	1.25	0.86	0.88	1.2
Thailand	1.08	1.42	0.65	1.4
Syria	0.92	1.05	0.64	2.3
Sri Lanka	1.24	0.68	0.87	1.5
Jordan	0.85	0.81	0.99	1.9
Venezuela	1.27	1.14	0.90	0.8
Fiji	1.19	0.92	1.04	1.3
Jamaica	1.36	1.07	1.17	0.7
Malaysia	1.31	1.41	1.19	1.2
Portugal	1.49	1.52	0.59	1.0

Source:[2]
Notes: a) Countries are ordered by level of under five mortality
b) Index of son preference (from the World Fertility Survey) - Ratio of the number of mothers who prefer the next child to be male to the number of mothers who prefer the next child to be female

Maternal Mortality

Each year at least half a million women die from causes related to pregnancy and childbirth.[3] All but about 6,000 of these deaths occur in developing countries. (Table 2) Maternal mortality rates are highest in Africa, with community rates of up to 1000 per 100,000 live births reported in several rural areas. The risk of dying from maternal causes is somewhat lower in the urban areas of Africa, but rates of over 500 have been reported in several cities. High maternal mortality rates are compounded by high fertility.

TABLE 2
ESTIMATES OF MATERNAL MORTALITY

Region	Live births (millions)	Maternal Mortality rate (per 100,000 live births)	Maternal deaths (thousands)
AFRICA	23.4	640	150
ASIA	73.9	420	308
Western	4.1	340	14
Southern	35.6	650	230
Southeastern	12.4	420	52
East	21.8	55	12
LATIN AMERICA	12.6	270	34
OCEANIA	0.2		2
DEVELOPING COUNTRIES	110.1	450	494
DEVELOPED COUNTRIES	18.2	30	6
WORLD	128.3	390	500

Source:[2]

Maternal mortality rates have declined significantly in almost all developed countries in recent years. Table 3 shown such trends for selected countries.

TABLE 3
CHANGES IN MATERNAL MORTALITY IN SELECTED COUNTRIES

Country	1965	1975	change	Latest
USA 32	13	-59%	9(1980)	
France	23	20	-13%	13(1980)
FRG	69	40	-42%	11(1983)
Czechoslovakia	33	18	-49%	8(1982)
Greece	46	19	-59%	12(1982)
Portugal	85	43	-48%	5(1984)
Japan	88	29	-67%	15(1983)
Romania	86	121	+41%	149(1984)
Romania, excl. abortion	85	31	-52%	21(1984)

Source:[4]

Sri Lanka is an interesting success story. From a level of 522 in 1950-5 the maternal mortality rate, excluding abortions, fell to 260 ten years later and to 87 in 1980.[5] No doubt the fact that 85% of the births in Sri Lanka are attended by trained attendants and 76% take place in institutions provides at least part of the explanation. Over the same period the total fertility rate fell from 5.3 in 1953 to 3.8 in 1977 and contraceptive prevalence rose from 32% in 1975 to 48% in 1981-82.[5]

As overall maternal mortality has fallen it has usually been deaths from sepsis that have declined first. In Sri Lanka in 1950-55 one-quarter of the maternal deaths were due to sepsis. By 1977 the proportion had fallen to 10%.[5] In China, where overall rates have fallen from several hundred to 49 in 1984 deaths from sepsis now account for only some 6% of all maternal deaths. Such declines reflect both improvements in the standard of delivery care, such as, for example, the emphasis on the three cleans (clean hands, clean delivery surface, clean cord care) and antibiotics.[6] Deaths from hemorrhage are usually slower to decline. The short time between the onset of serious bleeding and death means that access to life saving interventions is crucial.

Hypertensive disorders of pregnancy (HDP) remain one of the more common morbid conditions of pregnancy. The death rate due to HDP seems to fall more slowly than that from sepsis. The prevalence of HDP and eclampsia vary widely.[7] It is noteworthy that the fall of mortality from HDP in such countries as Sweden was not a function of a decline in the incidence of eclampsia but was the result of the decline in the case fatality rate.[8]

Severe anaemia in pregnancy contributes greatly to maternal morbidity and mortality. In rural India in 1981 anaemia was given as the second most important cause of maternal mortality after hemorrhage, where it is usually a contributing factor.[9] Together these two causes accounted for 41% of maternal deaths. In one study from India the risk of a maternal death was increased 14 fold when the women had a haemoglobin level of less than 8 gms.[10]

On the basis of a review of all information available in 1979, it was estimated that in 1975 there were some 230 million anaemic women in the world; about half the non-pregnant women living in developing countries and two-thirds of those pregnant. The highest proportion of women with haemoglobin concentrations below the WHO norm is in Asia, followed by Oceania and Africa.[11]

Very young age is an added risk in childbearing the world over. Teenage marriage is widespread in the developing world, with the highest recorded incidence in Bangladesh where 90% of women are married before they are 18 years old. By the age of 17 almost half of all women in Bangladesh are mothers and by the age of 19 one-third have at least two children.[12] In Bangladesh girls age 10 to 14 had a maternal mortality rate five times higher than, and women age 15 to 19 twice as high a rate as, women aged 20 to 24.[13] Even in the U.S.A. girls under 15 have maternal mortality rate three times that of women aged 20 to 24.

TABLE 4. MATERNAL MORTALITY AND TEENAGE PREGNANCY
Rate per 100,000 live births

COUNTRY/YEARS	Age group: 15-19	20-34
Argentina 1980-1981	55	50
Brazil 1984	106	80
Indonesia 1980-1982	1100	575
India 1978-1982	380	255
Bangladesh 1982-1988	860	479
Nigeria 1983	526	223
Ethiopia 1981-1983	1270	436
Egypt 1981-1983	268	155
Algeria 1971-1980	205	78

Source:[14]

Unwanted Pregnancy and Abortion

A considerable proportion of the very high fertility observed, in particular in developing countries, is unwanted. If all women who said they wanted no more children were actually able to stop childbearing, the number of births would be reduced by an average of 35% in Latin America, 33% in Asia and 17% in Africa.[15]

The incidence of abortion and its consequences and complications represents a public health problem of major dimensions in a large number of countries regardless of whether the procedure is legally available and accessible or not. In all settings its occurrence and persistence reflects the failure to satisfy the fertility regulating desires and needs of women. That failure may represent a combination of societal actions or inaction (policies, access to information and services, etc.), personal health behavior and choice, and contraceptive failure.

Even an estimate of the incidence of legally induced abortion is difficult to obtain, while estimates of illegally induced abortion are generally unreliable. However, estimates based on either official reporting or secondary date sources, suggest that there are some 33 million legally induced abortions performed annually (with a low of 30 and a high of 40 million). The Soviet Union and China account for fully 25 million of these cases.[16] Estimates of the number of illegally induced abortion are highly speculative. The total number of abortions is estimated to be between 40 and 60 million. On a global basis that level of abortion would suggest there are from 24 to 32 induced abortions for every 100 known pregnancies.[16]

From the available studies on the causes of maternal mortality, even in the rural areas of south Asia, as many as 20 to 25 percent of the maternal deaths are attributable to the consequences of induced abortion, usually clandestine. Thus it can be reasonably estimated that there are at least 70,000 to 90,000 abortion-related deaths each year in Asia. Hospital based studies in India during the period just after the legalization of termination of pregnancy in the years 1972-1978 indicated the induced abortion, in most instances illegally induced despite the legalization, accounted for between 15 and 26 percent of maternal mortality.

Hospital based studies using a standardized definition of illegally induced abortion indicates that case fatality rates range from 0.02 to 4.0 percent,[17] although studies reported in the literature describe rates as high as 30 or 40 percent.[18] Thus, using the standardized criteria, and based on the proportion of maternal mortality attributable to abortion, there are probably at least 2.25 million women with complications of illegally induced abortions a year in Asia. What proportion have had an illegally induced abortion without any occurrence of complications is difficult to estimate and varies quite widely with the safety of performance of the induced abortion. In Turkey, where before legalization of induced abortion. Most abortions in urban areas were performed by professional health workers, barely one case in 20 sought subsequent care for complications.[19] Case fatality rates in hospitalized cases of septic or induced abortion in India range from as low as 1.0 to as high 17 percent. However, the denominator in these estimates is likely to have been grossly underestimated, the definitions having been based on existing hospital coding practices and not according to WHO criteria. In 1980-81 there were over 380,000 legal abortions reported in India.[20]

The effect on maternal mortality of a change in the legal status of abortion has been well documented in several countries. In Romania, where abortion had been widely available and practiced, after it was made illegal both the birth rate and the maternal mortality rate rose sharply. The maternal mortality rate has stayed high, with 80 per cent of maternal deaths being abortion related (Table 3), while the birth rate has gradually returned to the low levels of the early 1960s. In Cuba, between 1968 (when abortions were first permitted in hospitals) and 1976, about half of the decline in maternal mortality from 85 to 46 was attributed to the decline in abortion associated deaths.[21]

Perinatal Mortality

Perinatal mortality rates, although difficult to obtain, serve as a powerful indicator of the health status of the mother and the quality of care she receives during pregnancy and delivery. Information on perinatal mortality is often unreliable and difficult to obtain because of incompleteness of reporting and variations in the definitions used. Under-reporting of perinatal or even neonatal mortality is far more common than the under-reporting of infant mortality and may have contributed to the failure of health authorities to recognize both the importance of the problem and the possible options for action.

TABLE 5. ESTIMATES OF PERINATAL MORTALITY

Region	Live births (millions)	Perinatal Mortality rate (per 100,000 live births)	Perinatal deaths (thousands)
AFRICA	22.5	81	1831
ASIA	76.1	59	4489
Western	4.2	55	232
Southern	37.0	87	3204
Southeastern	12.8	52	666
East	21.8	20	465
LATIN AMERICA	12.6	54	674
OCEANIA	0.2	13	7
DEVELOPING COUNTRIES	110.1	62	7135
DEVELOPED COUNTRIES	18.2	18	163
WORLD	128.3	57	7298

Source:[22]

High perinatal mortality rates, between 80 to 100 per 1,000 live births, are found among the least developed and most disadvantaged countries; and, moderately high rates, i.e., 35 to 60/1,000 live births are found in most developing countries. In most developed countries and a number of developing countries with strong programmes of maternal health care the perinatal mortality rate is in the low 20s; and, in a few instances such as Japan, the Nordic countries and the Federal Republic of Germany, the rate is below 10.

Because birth weight itself is such a major determinant of perinatal mortality, comparisons of perinatal mortality must make an adjustment for differences in birth weight distribution.[23]

Even in many of the least developed countries as much as 40 to 50 per cent of the infant mortality occurs during the first month of life, largely in the first week.

Perinatal mortality rates within a country are a very sensitive indicator of the programme interventions and are useful as an indicator of the quality of care in different populations and areas of a country. The timing of a perinatal death, i.e., antepartum, intrapartum and post-partum, also provides a good measure of the quality of maternal health care services. In European countries with perinatal mortality rates around 10/1000 live births, the ratio of fresh stillbirths to macerated stillbirths is 0.2. In two developing countries where special studies were carried out the ratios were much higher,

suggesting inadequate referral and management of pregnancies at risk of complications.[24]

In a number of developed countries and a few small developing countries perinatal mortality has decreased by half over the period from 1965 through 1980. (Table 6) Investment in high technology is not the only way such declines

TABLE 6. PERINATAL MORTALITY RATES (per 1000 live births) FOR SELECTED COUNTRIES, 1965 - 1984

Year	Sweden	Singapore	England & Wales	France	Japan	Mauritius
1965	19.9	25.8	27.3	28.2	30.1	82.0
1970	16.5	21.7	13.8	23.7	21.7	60.9
1975	11.3	16.7	19.9	18.3	16.0	61.1
1980	8.7	13.5	13.4	13.0	--	39.5
1984	6.8	10.4	10.1	11.3	8.0	32.1

(1985)

Source:[23]

have come about. Regionalization of perinatal care, the application of a risk approach and a greater understanding of the pathophysiological basis of perinatal morbidity and mortality with better management of pregnancy and delivery have in many instances contributed to this decline without major investments in facilities and equipment. Even within a four year period of time, with no increase in medical or maternity expenditures, a reduction of over 50 percent in perinatal mortality and in stillbirth rates was accomplished through a primary health care programme among plantation workers and their families in South India. (Table 7)[24] In contrast to post-neonatal infant mortality, social, economic and environmental improvements have far less of an impact during this period except insofar as they affect maternal health and low birth weight.

TABLE 7. COMPREHENSIVE LABOR WELFARE SCHEME ESTIMATES: DATA ON STILLBIRTH AND PERINATAL MORTALITY RATES*
(Per 1000 Live births)

Year	Still birth rate	Perinatal mortality rate
1979	69.8	109.7
1980	44.3	82.5
1981	36.6	73.2
1982	27.9	47.7

Source:[25]
*Total population covered by the CLWS was over 250,000

Low birth weight and pre-term delivery

Although this paper is intended to examine maternal, perinatal and infant mortality, it is useful to give a brief consideration to the problem of low birth weight (LBW), since under many circumstances it may be a more sensitive indicator than maternal or infant mortality for evaluating MCH intervention strategies by the health or other sectors. The birth weight of an infant is the single most important determinant of it's chances of survival and healthy growth and development. Because birth weight is conditioned by the health and nutritional status of the mother, the proportion of low birth weight infants closely reflects the health status of the communities into which they are born.

Low birthweight can be caused by short gestation and/or by retarded intrauterine growth. Although etiologically distinct, both have an important effect on fetal and neonatal mortality. A review carried out in 1984 led to an estimate of 20 million LBW infants, or 16% of the those born in 1982. This constitutes a fall in both relative and absolute terms when compared to estimates for 1979 of 21 million LBW infants making up 16.8% of the 122 million born that year.[25]

The incidence of LBW by region ranges from 31.1% in South Asia and 19.7% in Asia as a whole to 14.0% in Africa, 10.1% in Latin America, 6.8% in North America and 6.5% in Europe. There is no evidence of any improvement in South Asia, the region where the problem is most acute. Rates in that region remain between 20% and 50%.[23]

Infant and Child Mortality

While not as great as the differentials in maternal mortality the differences between the infant and child mortality in the poorest countries and the most privileged are up to 30 fold. On average one in 12 infants in the developing countries dies before reaching the age of one, compared to one in 71 in the industrialized countries. For children under 5 the ratios are one in 8 compared to one in 56.

Differentials are not confined to comparisons between countries, for even within developed countries there are two- to threefold differences in infant, neonatal and post-neonatal mortality rates between the most and least socially advantaged groups.

In 1986 over 14 million children died before reaching their fifth birthday, two-thirds of them aged less than one year. Ninety-nine per cent of all infant and child deaths in the world are in the developing countries, although these countries account for only 85% of all children under the age of 5 (67).

Nevertheless, considerable progress has been made over the last 30 years. Despite the fact that the annual number of births has increased from 86 million in 1950 to 130 million in 1986, the annual number of infant deaths has fallen from 16 million in 1950 to some 14 million in 1986. The infant mortality rate for developing countries as a whole fell from 188 in 1950 to 92 in 1980 and 81 in 1986; the under 5 mortality rate fell from 295 in 1950 to 142 in 1980 and 124 in 1986. The UN Population Division projects a further reduction of some

30% in the infant mortality rate of developing countries between 1985 and 2000, to a level of 61. A similar fall to a level of 11 in 2000 is projected for the developed countries.

The main killers of young children in high-mortality countries are the infectious diseases.

TABLE 8. CAUSES OF DEATH OF CHILDREN UNDER FIVE

	Million p.a.
Acute Diarrhoea and related causes	5.0
Malaria	3.0
Measles	2.1
Neonatal tetanus	0.8
Pertussis	0.6
Acute respiratory infections	4.0
Typhoid fever	0.5

Source:[25]

Infant and Child Mortality from Immunizeable Disease

In many developing country societies, the common pattern is that of repeated infectious diseases during childhood, with as much as 30 to 40% of a child's life spent suffering gastrointestinal, respiratory or other infections.

In 1974, when the Expanded Programme on Immunization (EPI) was established by the WHO, less than 5 percent of infants in the developing world were fully immunized. In 1988, 50 percent of the infants in the developing world now receive the third dose of DPT or polio and more than 60 percent receive at least the first dose. However, vaccine coverage in the developing world is lowest for the two EPI diseases which cause the highest number of deaths--measles and neonatal tetanus. These two diseases account for over 80 percent of the 3.4 million deaths annually attributable to the EPI target diseases. Measles immunization is at the level of 35 percent, while immunization of pregnant women against tetanus is at the level of 16 percent.

Measles affects 70 million children yearly in the developing countries. About two million of these cases end fatally. Protein energy malnutrition commonly increases the risk of death and is often an important factor in growth retardation. Although the case mortality rate in developed countries is not high, complications are not infrequent. About one percent of cases are hospitalized and encephalitis affects one case in 2000 with frequent sequelae of permanent brain damage and mental retardation. Case fatality rates are often over one percent in the developing world.

Mortality from neonatal tetanus in some areas of the world has been as high as from 100 to 260/1,000 live births. In Haiti, the introduction and improvements in the training of traditional birth attendants had reduced those rates by as much as half by 1962. The subsequent introduction of immunization of pregnant women and later of all women in an outreach programme eliminated the disease as a public health problem.[28] Similar marked reduction in neonatal tetanus was found in China with the simple adherence to the principles of the

"three cleans" in the training of the traditional birth attendants: clean hands, clean delivery surface and clean cutting and care of the umbilical cord. (WHO 1985)

Of an expected 850,000 deaths from pertussis, approximately 30 percent have been prevented through immunization. Of an expected 365,000 cases of poliomyelitis, nearly 40 percent have been prevented. In a follow-up of the EPI programs in Indonesia, the decline in the morbidity rate of diphtheria corresponded to the level of coverage achieved with two doses of DTP.[29]

Diarrheal disease mortality and morbidity

The incidence and case mortality rates for diarrheal disease have been difficult to obtain and difficult to compare over time and between different countries. Nevertheless, the Diarrheal Control Programme of WHO has summarized the results of 193 surveys in 49 countries in which the standardized WHO/CDD methodology was used (Table 9). The median number of diarrheal episodes per year for children globally is estimated to be 3.6, with the Americas region surveys showing a median of 6.2 and the Western Pacific surveys having a median of 2.2. Globally it is estimated that one-third of the child deaths are associated with diarrhea.[30]

TABLE 9. SUMMARY OF RESULTS OF 193 DIARRHEA MORTALITY, MORBIDITY, AND TREATMENT SURVEYS OF CHILDREN AGED 0-4 YEARS.

WHO Region	Number of Surveys (countries)	Mortality rates/1000 children (Median)		Percentage of deaths Diarrhea-Associated	Annual Incidence (episodes/ child/year)
		All causes	Diarrhea-Associated		
AFR	40 (17)	32.0	11.5	41.1	4.7
AMR	6 (6)	11.0	3.9	34.9	6.2
EMR	32 (9)	15.7	6.7	43.2	3.8
SEA	67 (9)	13.7	3.6	28.3	3.2
WPR	48 (8)	8.4	2.2	22.4	2.2
Total	193 (49)	18.0	5.6	36.0	3.6

Source: 29)

Coverage of maternal and child health care, including family planning

Almost everywhere there is a dearth of systematic, comprehensive and critical reviews and evaluations of programme coverage, performance and effectiveness. Wide variations in the proportion of women receiving prenatal care exist both between and within geographic areas. In Africa the proportions range from 33% to 90%, in Latin America from 20% to 81% and in Asia from 5% to 98%.

Maternal Care

In a significant number of cases, and especially in rural areas, the percentage of women receiving prenatal care (by a trained attendant) exceeds the percentage receiving skilled intrapartum care. This discrepancy between

high levels of prenatal care coverage and somewhat lower levels of supervised delivery care coverage in some instances may be related to the geographic inaccessibility due to lack of transport and the distances and time necessary to travel once a women goes into labor. But in many settings, cultural preference and distances may play an equally if not greater role. Hassouns had described how even the majority of non-professional health workers are delivered by a traditional birth attendant in Cairo, despite the availability and their knowledge of the delivery care facilities[32]. A similar preference for traditional birth attendants, who are more like family birth attendants, has been noted in Zimbabwe.[33]

On the basis of available information, it is possible to build up estimates for the coverage of maternity care in the various regions of the world. These estimates show that only some 55% of the births in the world are attended by trained personnel. Even fewer take place in an institution. This means that some 58 million of the 120 million infants born in 1983 were delivered with the help of untrained traditional birth attendants, family members or by the mother alone.

In the developed world nearly all births are attended by trained personnel but in the developing world, where 85% of the world's births take place, fewer than half were so attended.

TABLE 10. COVERAGE OF MATERNITY CARE
Estimated number of births and percentage attended by trained personnel around 1983

Region	Numbers of births (in millions)	Percentage of births attended by trained personnel
Africa	23.4	34
Latin America	12.6	64
Asia*	73.9	49
Oceania*	0.2	34
Europe	6.9	97
North America	4.4	100
USSR	5.1	n/a
Developing World	110.1	48
Developed World	18.2	98

Notes: *Japan, Australia and New Zealand have been excluded from the regional estimates, but are included in the total for developed countries,
Source: 30

The coverage of child health care is extremely difficult to quantify. If one uses immunization protection as a measure, many countries have shown spectacular progress. However, the use of immunization coverage as a surrogate for overall infant and child health care coverage is only possible in situations where immunizations are provided almost exclusively by the organized health services. Social mobilization and mass campaigns, while admirably

raising the level of protection in a relatively short period of time, and intended to lead to sustainability through the health system, do not really reflect overall care for children. Thus, for example, a recent evaluation of MCH services in Tanzania suggested that apart from immunization coverage, which ranged from 70% for BCG to 30% for measles, the programmes were having limited if any, impact on the main problems of mothers and children[34].

Family Planning

From only a few countries with family planning programme in the beginning of the 1960's, currently 120 governments now support either directly or indirectly such programmes. About 95% of people in the developing world live in countries which provide some form of public support for family planning programmes, generally as part of maternal and child health programmes. Contraceptive prevalence, as a measure of family planning programme effectiveness, has increased. In over 75 countries, with 60% of the world's women, contraceptive prevalence rates of 30% or above prevail. However, in over 50 countries with 20% of the world's women, prevalence rates are below 10%[35].

Despite the apparently high contraceptive prevalence rates in some countries there does not appear to be a commensurate change in fertility. This somewhat paradoxical observation has been attributed to high discontinuation and failure rates of certain contraceptive methods, and at times to over-reporting of acceptor rates in some programmes. Another contributing factor to an apparent lack of effect on birth rates despite an increased rate of contraceptive prevalence is the use of such methods by older couples who are already at a low risk of pregnancy.[36] The World Fertility Survey has shown a marked discrepancy in many countries between current fertility, numbers of unwanted births per woman and contraceptive prevalence. In Africa only 23% of women not wanting any more births are practicing contraception, in Asia it is 43% and in Latin America 57%. Evidently in many circumstances and in many countries either the methods and/or the services are not accessible and/or acceptable in physical, cultural or personal terms. As a consequence, deaths from illegally induced abortion continue to constitute from 25 to 50% of maternal mortality in many countries.

The pattern of use of different methods of contraception, often a consequence of availability, varies widely. For example, in Thailand of the 65% of the women practicing family planning, fully 90% are protected from unwanted pregnancies by such methods as sterilization, oral or injectable hormonal contraceptives or IUDs. On the other hand in Bulgaria, although 76% are practicing family planning, these effective methods are being used by less than 10% of contracepting women. Globally about 325 million couples out of 800 million of reproductive age are using an effective method of contraception, namely:

135 million - sterilization
70 million - IUD
55 million - oral hormonal contraceptives
37 million - condoms
30 million - injectable hormonal contraceptives, barrier methods and other modern methods

Another 20 to 40 million use traditional methods such as periodic abstinence or withdrawal.[37]

TABLE 11. CONTRACEPTION: ESTIMATED PERCENTAGE OF MARRIED WOMEN OF REPRODUCTIVE AGE PRACTICING CONTRACEPTION 1980-1981

	Percent
World total	45
Total excluding China	38
Developing regions:	
Total	38
Total excluding China	24
Africa	11
Asia	42
East Asia	69
South Asia	24
Latin America	43
Developed regions:	
Total	68

Source: 43

Primary Health Care and Maternal and Child Health, including Family Planning

Primary health care has inherent to it the concept of placing the appropriate technologies at the most appropriate level of the system. Over the last several years both research and experience has shown that many of the appropriate technologies in MCH/FP can be successfully transferred to families and communities. Such successful transfers have included; community-based distribution of contraceptives and of oral rehydration salts; home preparation of ORT; growth monitoring and follow-up action by women's organizations, teachers and others: home-based monitoring of pregnancy and of child health and growth through the use of home-based records; and the identification and referral by traditional birth attendants of pregnancies at potential risk of complications.

Since some of the essential technologies for MCH/FP cannot be made available at the PHC level, they must be available and accessible at the level of first referral. Thus, for example, without the availability of the skills, supplies and equipment for an assisted delivery, cesarian section, the provision of blood, etc. little progress will be made in significantly lowering the very high maternal mortality rates found in many countries.

If the different levels of care are not integrated and mutually supportive, although all the technologies may be appropriately placed, there will be only a limited impact, particularly in such areas as maternal health.

The field of MCH/FP experienced the debate for many years as to whether and how to integrate the MCH and FP components. In most countries that debate

had been resolved, although functional integration continues to elude many countries, in large part due to the legacy of discrepancies in policies, resource allocation (including external resources), management support, training, etc. More recently major advances in the development and adaptation of other appropriate MCH/FP technologies has come about, such as those related to immunization and oral rehydration therapy. However, many countries have failed to learn the lessons of the MCH and FP debate, once again developing vertical structures for the delivery of these services.

Does the emphasis on one technology or programme area have a beneficial spill-over effect, a detrimental or no effect on the other aspects of MCH/FP? A recent evaluation of MCH services in Tanzania suggested that apart from immunization coverage, which ranged from 70 percent for BCC to 30 percent for measles, the programmes were having limited if any impact on the main problems of mothers and children.[38] There was no "spill-over" effect.

The needs for the future in maternal and child health including family planning have been aptly summarized in the WHO Expert Committee report on MCH/FP.[39] "If the focus of health care is to shift from the hospital to the community, and from selected coverage to total coverage, community and family health, particularly MCH care, must be made the central objective of basic and continuing education for all members of the health team. Moreover, to ensure the integration of MCH care in the general community health services, the MCH content should be incorporated into the curricula for the basic and postgraduate preparation of health personnel in universities and professional or vocational schools. This calls for a vast expansion and reorientation of the education system for health personnel and for basic changes in the philosophies of medicine, nursing, and allied health professions, coupled with the reformulation and reshaping of curricula and methods of teaching."

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Determinants of Trends in Infant Mortality Rates in Developing Countries*

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Current Status

Data on infant mortality in developing nations are generally incomplete, incorrect and often nonexistent in terms of age groups, causes or other specific factors. Nevertheless, certain glaring facts as are available, cannot be ignored.

About 11 million infants died during 1988 in the world. Of these, 10.7 million or 97% occurred in less developed countries, predominantly (65%) in Asia. The countries with the greatest number of infant deaths during 1975-80 ranks India as first, followed by China, Bangladesh, Nigeria, Indonesia and Pakistan.

The Trends

The situation had been more grim earlier but has shown substantial improvement. Between 1950-1955 and 1975-1980, the infant mortality rate for the world declined from 138 to 88 per 1,000, a decline of about 36%. However, on a regional basis, the proportional declines varied considerably: Only 31% in Africa and 34% in South Asia, but 60% or more in the Soviet Union, East Asia and Europe.

In terms of infant mortality rates, the highest during 1975-1980 were for Africa and South Asia: 125 and 120, respectively. Thus, more than one of every ten children born in Africa and South Asia die before reaching their first birthday. No doubt considerable variation exists within each region, as in South Asia, where the infant mortality rate for 1975-1980 ranged from a low of about 13 per 1,000 for Singapore to around 260 per 1,000 for Democratic Kampuchea.

Improvements in infant mortality rate are projected to continue throughout the remainder of this century and into the next. Globally, the rate of decline in infant mortality is anticipated to be approximately 34% between 1980 and 2000 (i.e., from 88 to 58 per 1,000) and 47% between the year 2000 and 2025 (i.e., from 58 to 31 per 1,000). However, while the rates for Africa and South Asia are projected to improve, the levels by the year 2000 are anticipated to remain well above 50 per 1,000: 84 and 76 per 1,000 respectively.

In a few countries such as Sri Lanka, where a combination of economic, social and political circumstances permitted a multi-pronged attack on the disease spectrum, the decline continued almost unabated until mortality levels were almost as low as in the low-mortality countries. However, in some of the largest countries of the region, such as Bangladesh and India, mortality

decreased at a slower rate and the decline itself slackened considerably in the 1970s, while death rates were still high. Among the reasons cited for this stagnation, is that the class structure of essentially poverty-stricken peasant societies weigh heavily against social changes conducive to mortality decline and mitigates against the rapid introduction and acceptance of new medical technologies and health-promoting behavioral changes.

In brief, despite the uncertainty and ambiguity, many developing countries have shown substantial declines in the infant mortality rates but, they are still too high compared to that prevailing in the more developed areas in the world.

The Determinants

The determinants of infant mortality are both 'exogenous' and 'endogenous'. Exogenous causes of infant mortality relate mainly to the environment and include deaths due to infections, parasitic or respiratory diseases. Endogenous causes, on the other hand, form a 'hard core' and include deaths due to congenital malformations, circumstances of prenatal life and the birth process. All social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms, or proximate variables, which can be grouped into five categories or factors, viz., maternal factors, environmental contamination, nutrient deficiency, injury and personal illness control. Infant mortality in a population is also determined by the following six proximate variables: (1) prenatal medical care, (2) prenatal non-medical care, (3) medical care at birth, (4) postnatal non-medical care, (5) postnatal medical care, and (6) postnatal curative medical care. Further extension of this framework was given by Nag (1988) consisting of 9 variables operating at conception, prenatally, at delivery and postpartum: (1) reproductive health of mother at conception (e.g., nutritional status and other indices of maternal health), 2. genetic constitution of infant (e.g., reflecting congenital abnormality). 3. prenatal medical (e.g., immunization of pregnant mother). 4. prenatal non-medical care (e.g., nutrition and workload during pregnancy), 5. medical care at delivery (e.g., attendance by medical, paramedical, or other personnel), 6. non-medical care at delivery (e.g., hygienic and sanitary conditions), 7. postnatal medical care (e.g, immunization of infant, treatment of illness), 8. postnatal non-medical care (e.g., infant feeding practice), 9. accident injury (e.g., fire, flood, boat accident).

The infant mortality rate (IMR) is universally recognized not only as a most important indicator of the health status of the children, but also of the level of social development.

The gap between urban and rural mortality varies from country to country as well as over time. In most developing countries, rural levels of mortality were found to be higher than those in the urban areas (Table 1).

Table 1

Urban-Rural Differences in Mortality in Selected Countries of the ESCAP region

COUNTRY	PERIOD		INFANT MORTALITY RATE URBAN	RURAL
BANGLADESH	1970 - 1974		115	137
CHINA	1975	MALE	10.2	20.5
		FEMALE	9.7	19.8
INDIA	1978		70	136
INDONESIA	1970 - 1974		60	96
NEPAL	1970 - 1974		112	157
PAKISTAN	1969 - 1973		118	147
PHILIPPINES	1973		49 - 64	61 - 78
SRI LANKA	1969 - 1973		52	49
THAILAND	1964 - 1965		68	86

Very few studies of differential mortality have attempted to separate the effects of individual components of the socio-economic status (such as education of mother or parents, living conditions of the family, living standards, availability of safe drinking water and sanitation). Usually, the relatively small sample size prevents disaggregation by more than two characteristics. Where such attempts were made, however, they show the mother's education is a component that has an independent and strong effect on reducing the risk of infant and child death apart from being a proxy variable for general socio-economic status of the family (Table 2 & 3).

Table 2

Infant Mortality by Region, Place of Residence and Socio-Economic status of the Family, Indonesia, Birth Cohorts 1970/71

REGION	SOCIO-ECONOMIC STATUS LOW	MEDIUM	HIGH
URBAN:			
WEST JAVA	114	76	28
CENTRAL JAVA	124	45	27
EAST JAVA	97	57	41
SULAWESI	79	91	17
RURAL:			
WEST JAVA	102	81	77
CENTRAL JAVA	103	80	93
EAST JAVA	79	80	N/A
BALI	94	67	48
SUMATRA	113	92	44
SULLAWESI	115	122	104

Table 3

Economic Status and Infant Mortality

	INFANT MORTALITY PER 1000 LIVE BIRTHS	DAILY ENERGY CONSUMPTION PER HEAD (MJ)	GNP PER HEAD (US $)
DEVELOPED	22	14.2	5200
LESS DEVELOPED	109	9.2	470
OF WHICH: LEAST DEVELOPED	156	8.4	140

In another study, the correlations between IMR and life expectancy at birth with available social and economic measures for the 99 third world countries were determined (Table 4). The mortality measures correlated highly with education and the practice of family planning. With regard to schooling, 1960 was still more important than 1981 and females literacy more than males. Physicians are of considerable significance (much more so than nurses) and so is nutrition. Income is of surprisingly little importance. The only correlation that is significantly higher with infant mortality than with life expectancy is that with the density of nurses (in marked contrast to the situation with regard to physicians), and this may be a telling indication of their importance in antenatal and postnatal care.

Table 4

Correlation Between Mortality and Various Other Measures, 99 Third World Countries

OTHER MEASURE	1982 IMR r		1982 e^0_0 r	
1960 percent females in primary school	-.8563	1	.08744	1
1960 percent males in primary school	-.8374	2	.8409	3
1981 percent wives practicing family planning	-.8234	3	.8660	2
1981 percent females in primary school	-.7932	4	.7835	5
1981 percent persons in secondary school	-.7917	5	.8404	4
1960 percent persons in secondary school	-.7338	6	.7800	6
1981 percent males in primary school	-.6219	7	.6236	9
1980 ratio of physicians to population	-.6105	8	.6733	7
1981 calories per capita	-.6095	9	.6511	8
1980 ratio of nurses to population	-.4401	10	.4246	10
1982 per capita income	-.3109	11	.3862	11

SOURCE: Population and Development Review, Vol. 12. No. 1. 1986 p. 179.

Infant mortality statistics include all deaths from ages 0 to one year. This grouping, if not broken down further, obscures some very significant data. The risks begin to appear even before birth, through the condition of the mother during pregnancy. If she is malnourished, if she is too young or too old, if her last child was born less than 24 months ago, if she already has four or more children and if she is deprived of basic pregnancy care, the risk of an abortion, a stillbirth or an early death is greatly enhanced. The perinatal mortality (i.e., from the 28th week of gestation to one week of life) varies by a factor of five between the lowest and the highest levels observed. It is also known that low birth weight is the single most important factor determining the survival chances of the child. The infant mortality rate is about 20 times greater for all LBW babies than for other babies, and the lower the birth weight the lower is the survival chance. In developing countries, three-fourths of all babies of low birth weight are full-term but, significantly are undernourished and small for their gestational age. Despite some recent decreases, the infant mortality rates in the majority of developing countries are high and mostly due to preventable conditions (Table 5).

Table 5

Neonatal, Post-Neonatal and Childhood Mortality Rates, by Certain Demographic Characteristics

DEMOGRAPHIC CHARACTERISTICS	NEONATAL (rates per 1,000 persons at risk)	POST-NEONATAL (rates per 1,000 persons at risk)	CHILDHOOD (rates per 1,000 persons at risk)
SEX OF CHILD:			
MALE	56.2	73.4	175.1
FEMALE	41.3	65.1	179.2
BIRTH ORDER:			
1	63.1	69.4	177.2
2	43.9	64.0	175.5
3 - 4	45.1	79.1	171.0
5 - 6	43.0	67.0	159.7
7 +	50.7	63.3	205.7
LENGTH OF PREVIOUS BIRTH INTERVAL (IN MONTHS):			
0 - 11	209.3	137.9	125.0
12 - 23	63.6	71.3	160.0
24 - 35	40.5	68.4	189.2
36 - 47	36.9	78.3	184.6
48 +	42.4	47.1	138.2
MOTHER'S AGE AT BIRTH OF CHILD (IN YEARS):			
15 - 19	64.2	76.4	192.4
20 - 24	44.1	73.1	174.5
25 - 29	39.1	69.0	159.2
30 - 34	41.7	65.5	183.8
35 - 39	60.4	55.4	177.7
40 - 44	63.0	42.1	200.0
MOTHER'S AGE AT MARRIAGE - (IN YEARS):			
LESS THAN 15	49.7	78.5	198.0
15 - 17	49.3	69.9	184.4
18 - 19	48.1	59.1	151.0
20 - 21	49.5	40.1	84.7
22 - 24	35.1	49.6	50.0
25 - 29	20.4	25.0	93.0

The inverse ratio of deaths in the neonatal and postneonatal periods in less developed countries is as striking as the greater magnitude of infant mortality as a whole. Indeed, this feature is in large part the reason for the higher rates. In more developed countries, the proportion of neonatal to postneonatal deaths is about 2:1. In less developed countries it becomes more nearly 2:3 (Table 6).

Table 6

Infant Mortality Derived from World Fertility Survey Data
Selected Countries

COUNTRY AND SURVEY DATE	TOTAL UNDER FIVE MORTALITY	INFANT MORTALITY		
		TOTAL	NEON-NATAL	POSTNEO-NATAL
SENEGAL (1978)	262.4	111.8	49.6	62.1
YEMEN ARAB REP (1979)	236.5	161.5	58.4	103.1
NEPAL (1976)	234.6	142.3	75.4	66.9
BANGLADESH (1975-1976)	221.6	135.0	73.7	61.3
PAKISTAN (1975)	207.2	139.0	79.9	59.0
EGYPT (1980)	190.6	132.3	58.7	73.7
INDONESIA (1976)	158.5	94.6	47.3	47.3
SUDAN (1979-1980)	150.8	78.6	41.5	37.0
KENYA (1977-1978)	141.6	86.6	37.8	48.8
MEXICO (1976-1977)	96.0	71.6	40.9	30.7
PHILIPPINES (1978)	92.9	58.3	24.5	33.7
SYRIA (1978)	86.1	64.6	15.2	49.4

Immaturity, birth injuries, congenital anomalies, asphyxia and atelectasis of the newborn, and tetanus neonatorum in less developed countries characterize the initial week. This is the hard core of infant mortality, where preventive measures have restricted effect, except in the case of tetanus, and therapy is of limited efficiency. Most deaths from tetanus and fatalities from late effects of causes originating in the early period, are features of the remainder of the first month, as are some immediately acquired infections. The deaths of the last eleven months are chiefly from infectious diseases acquired postneonatally, and a progressively increased incidence of malnutrition.

The inverse ratio does not arise from lesser numbers of neonatal deaths. Indeed, they are more frequent in less developed countries, although more as a result of the quality of medical care than because of any greater case incidence. The change in ratio comes about from undue numbers of infectious and nutritional disorders in the last six months of infancy.

Neonatal mortality, makes up a substantial portion of infant deaths, ranging in developing countries between about 35-60% of total infant mortality.

There is a great deal of evidence that deaths in the first few days of life are far less likely to be reported than deaths at any other stage of life, and so the number of neonatal deaths may be even greater than implied by these data.

Neonatal tetanus is perhaps the single most important cause of neonatal death in many countries, because of its high case-fatality rate (without treatment, close to 100%) and its high incidence. In many African and South-East Asian countries, mortality rates from neonatal tetanus of between 10 and 30 per 1000 live births have been recorded, and occasionally even higher. The global number of deaths due to neonatal tetanus is estimated to be between 750,000 and 1 million cases annually (Table 7).

Table 7

Neonatal Mortality and Neonatal Tetanus Mortality Rates per 1000 Live Births in Selected Countries based on Special Community Survey, 1978-83

COUNTRY	NO. OF LIVE BIRTHS SURVEYED	MORTALITY RATES/ 1000 LIVE BIRTHS		
		NEONATAL	NEONATAL TETANUS	% OF NEONATAL DEATHS DUE TO TETANUS
AFRICA				
IVORY COAST	2324	34	18	51
MALAWI	2081	29	12	41
EASTERN MEDITERRANEAN				
DEMOCRATIC YEMEN	6224	19	4	20
PAKISTAN	13858	52	31	60
SOMALIA	5781	91	21	23
SUDAN	9632	29	9	32
YEMEN ARAB REP.	5191	31	3	8
SOUTH-EAST ASIA				
BANGLADESH	2432	48	27	56
BHUTAN	952	19	13	67
INDIA (RURAL)	23482	19 - 93	5 - 67	16 - 72
INDIA (URBAN)	25843	5 - 26	0 - 15	0 - 59
INDONESIA (RURAL)	4971	21	11	51
INDONESIA (URBAN)	2310	17	7	40
NEPAL	3346	37	15	39
THAILAND	13659	21	5	23
WESTERN PACIFIC				
PHILIPPINES	8754	13	6	48

The single most effective measure for the prevention of malnutrition and protection against infection in infancy is breast feeding. The data suggested that infant mortality rates in developing countries are 5-10 times higher among infants who have not been breastfed or who have been breastfed for less than 6

months. Despite the marked advantages of breastfeeding, its popularity, as shown by the number of women who practice it and how long they go on with it, has declined significantly in many parts of the world. In developing countries, where the value of breastfeeding is most marked and where larger proportions of infants are at risk of malnutrition and infection, data gathered by a WHO collaborative study on breastfeeding indicate that in some urban areas relatively large proportions of mothers do not undertake breastfeeding. In the Philippines, for example, 33% of urban upper-income mothers and 15% or urban poor mothers who were interviewed had not breastfed their youngest child. Of those that do undertake it, many wean their infants before the age of 6 months. This appears to be the pattern among urban low-income families as well as upper-income groups. The prevalence and duration of breastfeeding among rural populations in developing countries, however, continue to be high, although in some cases nutritional and other health problem in infancy appear to be associated with the late introduction of appropriate and regular supplementary feeding (Table 8).

Table 8

Median Relative Mortality Risk in the Neonatal and Postneonatal Mortality by Number of Births in Preceding and Subsequent Two Years, Mean Infant Mortality Rate and Mean Duration of Breastfeeding, According to Region

PERIOD AND MEASURE	TOTAL	MIDDLE EAST AND N. AFRICA	SUB SAHARAN AFRICA	SOUTH ASIA	SOUTH EAST & E. ASIA	CARIB-BEAN	LATIN AMERICA
Neonatal (1st month of life)							
No. of births in preceding 2 yrs.							
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1 (alive)	1.58	2.24	1.57	1.47	1.99	1.43	1.61
1 (died)	3.49	4.18	3.16	3.35	2.80	5.00	3.56
≥ 2	3.22	4.57	2.39	3.35	3.19	1.85	3.25
Post neonatal (balance of 1st year)							
No. of births in preceding 2 years							
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1 (alive)	1.96	2.48	1.73	1.54	2.01	2.00	1.91
1 (died)	2.94	4.10	2.92	2.04	2.46	4.08	2.96
≥ 2	3.05	4.28	3.42	2.72	2.72	3.02	3.08
Mean infant mortality rate	82.8	86.7	99.1	119.1	59.2	66.2	66.4
Mean no. of months of breastfeeding	14.8	13.3	17.5	23.5	15.3	9.7	9.3

A number of studies have emphasized the role of disease control, sanitation measures and medical care in recent mortality decline in developing countries. Impressive recent reduction in infant mortality have been linked

inter alia to expansion in the provision of prenatal care for mothers and postnatal care for infants, to campaigns against diphtheria, whooping cough and malaria, as well as to progress in extending the coverage of safe water supplied in both urban and rural areas. Yet, at the same time, there is evidence that mortality decline may be slowing down or even halting in many developing countries. This raises a question about the effectiveness of current strategies of providing primary health care.

The experience in Philippines at Bohol was that, despite an active maternal and child health/family planning (MCH/FP) program, there was no decline in mortality during the project period. Of the explanations advanced, the most important ones are probably the lack of fit between services and conditions, the intractability of local health problems to available health technologies, the lack of resources for comprehensive primary health care, and the short time period. On the other hand, in Matlab, Bangladesh, an MCH-FP program produced a significant reduction in both neonatal and postneonatal mortality in the treatment area (Table 9a & b).

Table 9a

Trends in Infant Mortality Rates (per 1,000 births)
in Matlab, Bangladesh: Entire Study Area
1967-80

PERIOD	NEONATAL	POSTNEONATAL	INFANT
		ENTIRE STUDY AREA	
1967 - 68	67.8	57.6	125.4
1968 - 69	83.1	41.0	124.1
1969 - 70	87.5	40.0	127.6
1970 - 71	89.9	41.3	131.3
1971 - 72	83.2	63.6	146.8
1972 - 73	70.9	56.2	126.8
1974	78.1	59.8	137.9
1975	79.9	111.9	191.3
1976	65.2	37.6	102.8
1977	71.3	42.4	113.7
1978	74.1	46.3	120.4
1979	73.0	43.5	116.0
1980	66.6	37.3	103.9

Table 9b

Trends in Infant Mortality Rates (per 1,000 births) in Matlab, Bangladesh: MCH FP Treatment and Control Areas, 1979 - 81

PERIOD	NEONATAL	POSTNEONATAL	INFANT
		TREATMENT AREA	
1979	70.9	43.5	
1980	59.3	32.6	
1981	65.8	37.7	
		CONTROL AREA	
1979	74.6	43.3	
1980	72.7	41.3	
1981	69.0	46.3	

Source: Child Survival, Strategies for Research, Vol. 10, 1984,- pp. 289-290. Population and Development Review

In summary then, the determinants of infant mortality in developing countries are multifactorial in both the neonatal and postneonatal periods (Table 10).

Table 10

Causes of Infant Deaths

DEVELOPED COUNTRY	DEVELOPING COUNTRY
Birth injuries	Enteritis, Diarrhoeal diseases
Congenital anomalies	Influenza, Pneumonia
Influenza, Pneumonia	Bronchitis, etc.
Enteritis, Diarrhoeal Diseases	Whooping cough

Concerted and coordinated efforts will therefore be required of all the relevant programmes to enable countries to achieve progressive and significant declines in their infant mortality rates.

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Trends in Infant Mortality in India

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The infant mortality rate (IMR) and its two components, the neonatal mortality rate (NMR) and the post-neonatal mortality rate (PNMR), serve as useful summary indices of the level and manner of living of a people. The former serves as an index of the health status of women and the health attention they receive in the population, and the latter as an index of, particularly, the physical environment into which children are born. A study of the trends of infant mortality in a developing country like India can, therefore, throw light on the pace of health development as part of the overall socioeconomic development of the country.

This paper presents an overview of the trends in the infant mortality rate in India since the beginning of this century.

The Data Base

Prior to independence in 1947, the infant mortality rate (IMR) was estimated essentially from the live births registered by the civil registration system, which was particularly unsatisfactory in its coverage of births in rural areas. These estimates at the national level based on this source ranged from an average of 204 during 1911 to 1915 to an average of 134 during 1946 to 1950. [1,2]. However, estimates made by Census actuaries [3,4] during 1921-31 and 1941-51 were considerably higher, being 240 and 183 respectively. Subsequently to independence, the National Sample Survey (NSS) Organization, in five of its rounds of survey [5,6,7,8,9] provided data for estimation of infant mortality rates for the period from 1951 to 1965. The estimate of IMR for rural India based on NSS for the decade 1951-61 was 146, which showed a decline to 114 during the period 1964-65.

Realizing the inadequacies of the then existing civil registration system in India and also the potential for considerable recall lapse in the retrospective surveys of mortality by the NSS, the Registrar General of India's Office initiated the Sample Registration System (SRS) in 1964-65 to provide reliable annual estimates of birth and death rates at the national and state levels for urban and rural areas.

The SRS is based on a dual recording system consisting of continuous enumeration of births and deaths in a stratified, simple, random sample of villages/urban blocks followed by a six month retrospective survey of the same sample. Through a process of matching the data obtained through these two sources, an unduplicated count of births and deaths in the sample is determined and birth rates, death rates and infant mortality rates estimated.

Trend in Infant Mortality

The published SRS based data on IMR and its components are summarized in Tables 1 to 6 of this paper.

Table 1 presents estimated IMRs by rural/urban residence for males and females for the years 1968 to 1986. The urban estimates are consistently substantially lower than those for rural areas, both for males and females. However, the IMR in females is seen to be somewhat higher than that in males in the rural areas while it is similar for the sexes in the urban area. Fluctuation from year to year in a few cases is large but these are in all likelihood sampling fluctuations only.

The IMR for India for both sexes together remained stable around 130 until about 1978, after which it has shown a decreasing trend. In 1986 the overall IMR was 96. This decreasing trend is observed in both males and females. It is also seen that the difference in the IMR between males and females has also shown signs of narrowing down since 1979, a reflection of possible improvement in IMR in females in rural areas.

Table 2 presents the rural-urban differential in IMR for the period 1970-1986 using three-year averages, except for the two-year average for 1985-86. The data are presented for 15 major Indian states. The data present a very mixed picture. In Haryana, Orissa and Rajasthan, the IMR shows an increase in rural areas of about 10% between 1970-72 and 1973-75. The urban rates during the same period show no such increase. In fact, in Rajasthan the urban IMR shows a decrease of 6 points from 87 to 81. A smaller increase of about five percent is shown by the rates for Assam and Uttar Pradesh during the same period from 1970 to 1975. Himachal Pradesh, Karnataka, Kerala, Punjab and Tamil Nadu show a declining trend throughout the period from 1970 to 1986. The apparent increases in some of the States in the early 70's are probably due to underestimation of the IMRs at the start of the SRS. Also, the estimates seem to be affected by substantial random variations. Even the evidence of decline starting from the early 70's in some States could be discounted due to the SRS not having stabilized by then. However, starting from 1976-78, there is evidence of a welcome decline in IMRs in almost all states, barring Jammu and Kashmir, Orissa and to some extent Madhya Pradesh. The 1985-86 average IMR shows an apparent increase in Andhra Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir compared with the immediately preceding three years. The inter-state variations seen in this table, as well as variations in the same state over the 16-year period, need further detailed study by research scholars.

TABLE 1

Infant Mortality Rates in India by Rural Urban Residence and Sex, 1968 - 86*

Year	Rural Areas			Urban Areas			Total		
	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons
1968	136	138	137	NA	NA	NA	NA	NA	NA
1969	132	148	140	NA	NA	NA	NA	NA	NA
1970	138	134	136	94	85	90	131	126	129
1971	137	138	138	83	81	82	129	129	129
1972	141	161	150	85	85	85	132	148	139
1973	141	144	143	88	90	89	132	135	134
1974	137	136	136	74	74	74	128	119	126
1975	152	150	151	80	88	84	140	140	140
1976	133	146	130	78	82	80	124	134	129
1977	136	146	140	80	82	81	126	135	130
1978	132	143	137	74	75	74	123	131	127
1979	123	125	124	65	65	65	113	115	114
1981	NA	NA	119	NA	NA	62	110	111	110
1982	NA	NA	114	NA	NA	65	106	104	105
1983	NA	NA	114	NA	NA	66	105	105	105
1984	NA	NA	113	NA	NA	66	104	104	104
1985	NA	NA	107	NA	NA	59	96	98	97
1986	NA	NA	105	NA	NA	62	NA	NA	96

NA = Not Available

*Source: Sample Registration Bulletins for 1968 to 1988, Registrar General India, Ministry of Home Affairs, Government of India, New Delhi.

Table 2. Infant Mortality Rates by State and Rural-Urban Residence for 1970-72, 1973-75, 1976-78, 1979-81, 1982-84, and 1985-86*

States	1970-72			1973-75			1976-81			1979-81			1982-84			1985-86		
	Rur.	Urb.	All	Rur.	Urb.	All	Rur.	Urb.	All	Rur.	Urb.	All	Rur.	Urb.	All	Rur.	Urb.	All
India	141	86	132	143	82	133	139	78	129	124	66	115	114	66	105	106	61	97
Andhra Pradesh	122	70	112	122	71	113	130	75	121	103	52	95	83	57	78	89	58	83
Assam	141	82	134	142	97	139	121	94	119	106	67	104	99	73	98	112	83	110
Gujarat	151	112	142	152	105	141	146	98	135	124	95	117	122	72	108	118	65	103
Haryana	85	64	81	113	64	107	121	56	111	108	59	101	102	63	95	92	58	85
Himachal Pradesh	129	51	122	101	65	100	112	57	110	83	60	88	81	45	79	89	37	86
Jammu & Kashmir	82	47	76	40	70	74	40	70	74	34	68	46	78	57	72	90	51	83
Karnataka	103	65	95	93	60	85	93	61	85	83	47	74	78	44	70	81	55	71
Kerala	61	44	58	57	42	54	51	38	48	42	29	40	32	26	31	30	25	29
Madhya Pradesh	154	98	145	152	93	144	151	88	143	152	80	142	135	77	127	128	81	120
Maharashtra	109	81	101	109	78	99	101	62	91	90	53	80	84	56	75	76	47	66
Orissa	136	37	130	152	84	148	109	82	136	148	72	142	135	74	130	132	80	128
Punjab	114	80	107	111	71	103	117	76	110	92	64	87	81	52	74	75	53	70
Rajasthan	136	87	128	152	81	142	152	77	141	117	53	107	118	70	109	114	74	108
Tamil Nadu	131	84	120	123	68	109	118	74	106	117	61	95	96	54	83	94	54	81
Uttar Pradesh	184	116	174	189	123	182	181	118	174	164	100	157	163	99	152	147	83	137

* Source: Sample Registration System 1970-75, 1976-78, 1979-80, 1981, 1982, 1983, 1984, 1985, 1985a, 1985b, 1986a and 1986b. Registrar General of India, Ministry of Home Affairs Government of India, New Delhi.

Table 3 presents the SRS estimates of neonatal and post-neonatal mortality rates by rural and urban areas for the period 1970-85. The neonatal death rates remained quite high throughout this period in the rural areas at over 70 and at about 40 in the urban areas. Neonatal deaths expressed as a percentage of total infant deaths show a slowly increasing trend during the latter half of this period both in rural and urban areas. This is in conformity with the declining IMR during the same period, since it is known that post-neonatal

mortality is more easily amendable to reduction through public health action. The last 15 years have seen in India an increasing emphasis on maternal and child care as the thrust area in primary health care.

TABLE 3

Neonatal and Post-neonatal Mortality Rates in India* 1970-1985

Year	Rural Areas			Urban Areas			Total		
	Neo-natal	Post neo-natal	Neonatal as % of IMR	Neo-natal	Post neo-natal	Neo-natal as % of IMR	Neo-natal	Post neo-natal	Neona as % IMR
1970	72	64	52.9	46	44	51.1	68	61	53.1
1971	81	57	58.7	45	37	51.9	75	54	58.3
1972	77	73	51.3	45	40	52.9	72	68	51.5
1973	72	71	50.4	47	41	53.4	68	66	50.9
1974	76	60	55.7	41	33	55.4	70	56	55.6
1975	84	67	55.8	46	38	55.0	78	62	55.9
1976	83	56	59.7	49	31	61.2	77	52	59.7
1977	88	52	62.9	42	39	51.9	80	50	61.7
1978	80	56	58.8	41	30	57.8	77	50	60.9
1979	78	52	60.0	42	30	58.3	72	48	60.0
1980	76	48	61.3	39	26	60.0	69	45	60.5
1981	76	43	63.9	39	24	61.9	70	40	63.6
1982	73	41	64.0	39	26	60.0	67	38	63.8
1983	74	40	64.9	39	27	59.1	67	38	63.8
1984	72	41	63.7	40	26	60.6	66	38	63.5
1985	67	40	62.6	33	26	55.9	60	37	61.9

*Source: SAMPLE REGISTRATION SYSTEM (SRS), 1970-75, 1976-78, 1979-80, 1981, 1982, 1983, 198 1985 Registrar General of India, Ministry of Home Affairs, Government of India, New Delhi.

Table 4 presents the average neonatal and post-neonatal mortality rates for 1970-72, 1976-7 1983-85 for 15 major States in India.

TABLE 4

Neonatal and Post-neonatal Mortality Rates in Major States of India
1970-72, 1976-78 and 1983-85*

	Neonatal Mortality Rate			Post-neonatal Mortality Rate		
State	1970-72	1976-78	1983-85	1970-72	1976-78	1983-85
India	71.8	78.2	64.4	61.1	50.5	37.7
Andhra Pradesh	65.9	83.3	54.8	45.7	38.0	24.4
Assam	84.1	73.1	70.9	49.6	45.9	30.3
Gujarat	80.3	80.3	66.8	61.4	55.0	36.3
Haryana	42.6	64.0	49.5	38.7	47.3	42.7
Himachal Pradesh	60.7	48.7	40.9	61.0	61.0	43.7
Jammu and Kashmir	36.1	42.0	50.9	34.9	25.7	26.9
Karnataka	59.0	54.2	46.8	36.0	30.5	24.6
Kerala	37.1	29.6	22.0	23.0	18.7	9.00
Madhya Pradesh	76.8	77.4	74.2	68.2	65.6	48.7
Maharashtra	62.4	57.7	50.6	39.0	33.0	23.9
Crissa	71.0	75.8	82.4	59.3	59.9	47.3
Punjab	21.0	64.8	41.7	89.6	45.2	30.8
Rajasthan	70.4	79.4	68.0	52.6	61.9	45.3
Tamil Nadu	54.0	63.9	57.1	65.6	42.1	25.3
Uttar Pradesh	93.7	97.8	95.2	80.6	76.5	55.4

* Source: Sample Registration System, 1970-75, 1976-78, 1983, 1984, 1985 Registrar General of India, Ministry of Home Affairs, Government of India, New Delhi.

Table 5 presents neonatal mortality as a percentage of IMR for the same States for the same period.

TABLE 5

Neonatal Mortality Rate as Percent of Infant Mortality Rate for Major States, 1970-72, 1976-78 & 1983-85

States	1970-72	1976-78	1983-85
India	54.4	60.6	63.1
Andhra	58.8	68.8	69.2
Assam	62.8	61.4	70.1
Gujarat	56.5	59.5	61.9
Haryana	52.6	57.7	53.7
Himachal Pradesh	49.8	44.3	48.4
Jammu & Kashmir	47.5	61.8	65.4
Karnataka	62.1	63.8	65.6
Kerala	64.0	61.7	71.0
Madhya Pradesh	53.0	54.1	60.4
Maharashtra	61.8	63.4	67.9
Orissa	51.6	55.7	63.5
Punjab	19.6	58.9	57.5
Rajasthan	55.0	56.3	60.0
Tamil Nadu	45.0	60.3	69.3
Uttar Pradesh	53.9	56.2	63.2

The neonatal mortality rates show an increase between 1970-72 and 1976-78 in Andhra Pradesh, Haryana, Jammu and Kashmir, Orissa, Punjab, Tamil Nadu and Uttar Pradesh. The increases in Andhra Pradesh, Haryana, Punjab and Tamil Nadu are likely to be statistically significant though this cannot be tested with the available data. In Assam and Himachal Pradesh, there is a decline by more than 10 points during the same period. The 1983-85 average neonatal mortality rates, however, show a decline by more than 10 points in Andhra Pradesh, Gujarat, Haryana, Punjab, Rajasthan and Tamil Nadu, and a decline of only a little lower than 10 points in Himachal Pradesh, Karnataka, Kerala and Maharashtra.

Neonatal mortality rate as a percentage of IMR shows an increase in most of the States during the periods 1970-72 to 1983-85, except in Haryana and Himachal Pradesh. Punjab shows a very low proportion of neonatal deaths of only 19.6 per cent probably because of under reporting of neonatal deaths during the early years of the SRS in that State or misclassification of neonatal deaths, as post-neonatal deaths. The latter is a more likely explanation. The increases in the proportion of neonatal deaths, in a number of States, is, however, relatively small and does not always bear a consistent relationship to the level of IMR in these States.

Table 6 presents estimates of perinatal mortality rates and stillbirth rates obtained from the SRS reports. Estimates of early neonatal mortality rate and late neonatal mortality rate have been presented by subtraction of still birth rates from perinatal mortality rates, and subtraction of early neonatal mortality rates from neonatal mortality rates. Since it is likely that still births may not have been identified correctly in the field, these estimates of early neonatal mortality rates should be interpreted with caution. Also perinatal mortality rates and still births in the denominator. It is possible that early neonatal mortality is slightly under-estimated.

The estimates of early neonatal mortality rates in rural India account for about a steady 60% of the neonatal mortality rates since 1977. The rural rates are substantially higher than those in urban areas.

TABLE 6

Estimated Rates of Perinatal Mortality, Still births, Early and Late Neonatal Mortality Rates - India 1971-1985

Year	Perinatal Mortality Rate		Stillbirth Rate		Early Neonatal Rate*		Late Neonatal Rate**	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
1971	56.7	35.6	18.3	12.9	38.4	22.7	42.2	22.7
1972	53.3	36.6	18.5	14.4	34.8	22.2	41.8	22.7
1973	53.3	37.4	18.0	15.1	35.3	22.3	36.8	25.2
1974	55.1	36.3	17.9	12.5	37.2	23.8	38.5	17.2
1975	58.8	36.1	18.6	12.5	40.2	23.6	44.1	22.6
1976	76.6	76.6	43.7	18.7	57.9	32.6	25	16
1977	69.5	69.5	16.8	8.7	52.7	26.7	35	15
1978	67.9	67.9	33.5	16.0	51.9	23.2	33	15
1979	63.1	38.7	13.3	9.1	49.8	29.6	28	13
1980	59.8	35.3	12.0	7.9	47.8	27.4	28	12
1981	58.8	31.5	11.4	6.2	47.4	25.3	28	13
1982	57.7	33.1	9.8	5.2	47.9	27.9	25.0	10.9
1983	57.7	35.4	9.4	8.4	48.3	27.0	25.3	12.3
1984	58.3	35.7	11.0	7.9	47.3	27.8	24.9	11.9
1985	52.4	30.4	10.8	8.9	41.6	21.5	25.0	11.8

* By subtracting Still birth Rate from Perinatal Mortality Rate.
** By subtracting Early Neonatal Mortality Rate from Neonatal Mortality Rate.

Evidence available from prospective studies of mortality in infancy carried out in different parts of India since the late sixties for rural and urban areas are presented in Table 7.

TABLE 7

Infant Mortality, Neonatal Mortality and Post-Neonatal Mortality in Rural and Urban Areas of Prospective Studies in India

Location of study	Period of study	No. of live births	Neonatal Mortality Rate	Post-neonatal Mortality Rate	Infant Mortality Rate
Rural Areas					
Narangwal, Punjab[10]	1970-73	2984	60.0	44.9	104.9
North Arcot, Tamil Nadu [11]	1970-72	4757	60.5	53.6	114.1
Ludhiana, Punjab [12]	1978-80	1961	51.5	47.4	98.9
Rajpur Rani, Haryana [13]	1980	2480	38.7	38.7	77.4
Beri and Kalanur Blocks, Haryana [14]	1982-83	1779	55.1	43.8	98.9
Urban Areas					
Pondicherry [15]	1968-72	807	34.7	45.8	80.5
South Delhi [16]	1969-72	5592	21.2	24.2	45.4
North Arcot, Tamil Nadu [11]	1970-72	3485	43.6	65.7	109.3
Ludhiana, Punjab [12]	1978-80	925	25.9	29.1	55.1

The neonatal mortality rates in five of the six rural areas ranged between 50 and 60 indicating a relatively high level of mortality in very early childhood. However, these rates are considerably lower than the estimates for rural areas obtained from the SRS during the same period. This is because of the intensive nature of health care provided to the population, particularly mothers and children in these prospective studies carried out by highly motivated researchers. In two of these areas, North Arcot (Tamil Nadu) and in Ludhiana (Punjab), details of deaths in the first day of life was available and

they accounted for 25% and 40% approximately of the deaths in the first seven days of life.

In the four urban prospective studies, the neonatal mortality rate is seen to be considerably lower than in the rural areas corroborating the evidence available from the SRS figures also.

In summary, the following points can be made about the trends in infant mortality in India:

1. At about the time of India's independence in 1947, the IMR was possibly around 200 declining from a still higher level of about 240 during 1921-31 estimated by the Census. Based on NSS estimates for 1966-67, the IMR in 1961 could be placed around 160 or a little higher. The SRS estimates in the first few years starting from 1968 possibly underestimated the IMR resulting in an apparent stable IMR between 1970 to 1978. The IMR has since shown an accelerated decline from about 120 in 1979 to 96 in 1986 and 1987. The last decade has seen an increasing emphasis being placed on maternal and child care as the thrust areas in primary health care and it is not unreasonable to surmise that the accelerated decline in IMR is probably due to this.

2. The urban IMRs have consistently been substantially lower than the rural IMRs as revealed by the SRS estimates since 1970. The urban estimate for India for the period 1970-72 was 86 which progressively declined to 61 in 1985-86. The rural IMR, on the contrary, remained stable around 140 between 1970-72 and 1976-78 and only thereafter started declining. In 1985-86, it was 106.

3. The differences in the IMR between rural and urban areas are reflected in the neonatal and post-neonatal mortality rates also. The urban neonatal and post-neonatal rates were consistently lower than those in the rural areas. The neonatal mortality rates have not shown any noticeable decline either in the rural areas or urban areas between 1970 to 1985. The rural rates remained at a level of 75 while the urban rates remained a little above 40. However, the post-neonatal mortality rates showed a declining trend between 1975 and 1985. The rural post neonatal mortality in 1985 was 40 as compared with 26 in urban areas.

The interesting point to note, however, is that neonatal deaths as a percentage of the IMR showed little difference between rural and urban areas. There is a small apparent increase in the neonatal rate expressed as a percentage of the IMR particularly in the urban areas after 1975.

4. The IMR estimates as well as the neonatal and post-neonatal mortality estimates for the states of India show considerable variation. In 1985-86, IMR was highest for Uttar Pradesh at 137 and lowest for Kerala at 29. Seven of the 15 states had rates above 96, the all India estimate. The maximum estimate for rural areas was also in Uttar Pradesh at 147 and the minimum in rural Kerala at 30. These variations need to be studied in depth taking into account socio-cultural, economic and health care differentials that exist between the states. Sociocultural practices governing intranatal care and care of the newborn, availability and utilization of institutional intranatal care as needed, availability of general health care facilities to the poor are probably among

the important causes for the high neonatal mortality rates in a majority of the states.

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LEAD DISCUSSION

Shanti Ghosh

Instead of using the expression "mothers and children do not get adequate care," I would like to emphasize that women and children do not get adequate care. Women's health is important in itself, not only when she is pregnant or nursing the baby.

The health of the mother and the baby are interrelated. But one has to go back to growing up under discrimination. Several studies have shown that malnutrition is higher among girls than among boys and fewer girls attend health service compared to boys. In spite of the girls' biological advantage, the death rate is higher among girls resulting in a sex ratio favorable to men (1000 men to 933 women according to the 1981 census). Enrollment of girls in school is far less than for boys, and the dropout rate is very high. She leaves school to look after her younger siblings and to do the various work around the house. She knows no childhood, and her parents are awaiting the day when she will get married. In spite of the legal age of 18 for girls' marriage, a large number of girls get married much before that and may even have one or two children before they are eighteen. This jeopardizes their own growth; they have far more complications during pregnancy and delivery; and both the maternal and infant mortality are high among them.

Various correlates of high infant mortality are well known, i.e., both extremes of age, low socioeconomic status, low literacy, short spacing and high fertility. Several causes of maternal and infant mortality are common. Maternal undernutrition, as measured by her weight, height and anaemia, is correlated with poor pregnancy outcome and high perinatal and infant mortality. However, it is often difficult to isolate undernutrition from the various adverse patterns which coexist. It is the same woman who comes from a poor socioeconomic set-up, is underweight, has anaemia, works hard for several hours a day, lives under great stress, has a short spacing, has high fertility, does not have antenatal care and has very poor or no access to health services. It is very difficult to quantify the effect of all these factors individually.

Low birth weight accounts for one-third of the births and directly or indirectly results in high mortality. Low birth weight is associated with age, poor nutrition, anaemia, short spacing and high fertility. Weight less than 40 kg and height less than 145 cm account for a large proportion of low birth weight babies and increased risk of death. Due to poor or no antenatal services, risk factors are not identified. Anaemia is a major problem and even though we had an anaemia prophylaxis programme for almost twenty years, the coverage is only about 20%. In any case with such incidence of anaemia, we need an anaemia management programme and not a prophylaxis programme.

India has a vast health infrastructure with more than 100,000 subcenters manned by a male and a female multipurpose worker, about 16,000 primary health centers, and now an increasing number of community health centers with four specialists. Yet health services remain beyond the reach of a vast number of people. The Infant Mortality Survey of 1979 showed that only 42 percent of rural children who died in infancy had been seen by a medical person. The

figure for urban children was 65 percent. There is talk of several strategies of child survival such as oral rehydration, growth monitoring, immunization and better feeding practices. However, half the babies had already died by the time any one of them becomes operative, and so we have to aim at an integrated MCH/FP care within the orbit of primary health care.

India was one of the first countries to start a family planning programme, but the birth rate overall is still 32. It is supposed to be an integrated MCH programme, but in the field it is target oriented family planning with emphasis only on tubectomy, even though lip service is paid to spacing methods. While eliminating further births will be in the interest of maternal and child health, it can make no demographic impact. Due to high infant and early childhood mortality, every one wants to ensure the survival of two or three children. Several studies of the Family Planning Foundation recently have shown a marked correlation between infant mortality and fertility.

Everyone cites the example of the Indian state of Kerala, where health indicators are indeed remarkable, with a birth rate of 22 and infant mortality about 25. There are various factors which are interesting. The population density is the highest in Kerala. Villages are large and each village is connected to a motorable road, making mobility of the people and the health worker reach easier. Literacy level is very high (around 70%) and all children go to school. Access to information is much easier and there is awareness about health, cleanliness, immunization, etc. Because of easy access to health services and awareness, morbidity is not allowed to be converted into mortality. Per capita income is among the lower third of all the Indian states, and yet Keralites spend considerable money on private health care besides utilizing the government services.

Can anything be done? There are several NGOs who have shown the way by employing various strategies and interventions. They all have tremendous community participation in identifying priorities, planning and implementation. They have, with the help of the community, identified a link person in the village who interacts with the health system and identifies the eligible persons for health care. The traditional dai similarly identifies and manages the pregnant women and interacts with the ANM. Their training is good and relevant. The supervision is supportive, and there is a good referral system. There is a good documentation, so that pregnancies, child births and deaths are not missed. There is a fixed programme made well in advance which is strictly adhered to, so that the community and the link persons know exactly when the health personnel are coming. MCH and family planning are well integrated. So with a combination of community support, relevant training, supervision, and good management, a great deal of improvement has been brought about in the health indicators. Health education, communication and raising the status of women through literacy, non-formal education, etc., is an important part of the strategy. Health is not a medical matter alone, but various social-economic, educational and developmental strategies contribute to better health and better survival.

Overview of Trends in Maternal Mortality

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Every 60 seconds another woman dies as a result of pregnancy--about 500,000 maternal deaths each year.

During the past five years maternal mortality has been highlighted as a global public health problem, the resolution of which is an important part of any development effort. I shall highlight trends and patterns based on the recent Johns Hopkins Population Report entitled "Mothers' Lives Matter: Maternal Health in the Community," and draw on my experiences as an epidemiologist/demographer collaborating in maternal mortality studies to propose some approaches to studying maternal mortality in India.

How risky is pregnancy? The mortality rate ranges from 1 percent to one in 100,000. Since this risk is repeated for each pregnancy, a woman with 10 pregnancies in a lifetime has ten times higher risk than a woman with only one pregnancy.

The highest lifetime risk is in West, Central and East Africa where more than 4 percent of women die from pregnancy. In North and South Africa and South and Southeast Asia, between 2 and 4 percent of women die from pregnancy.

These estimates are consistent with data from rural India which show that pregnancy is the number one cause of death for women age 15-44 and that 15 percent of these deaths are due to pregnancy. These data may obscure some pregnancy related deaths which may be hidden among the other major reported causes of female mortality: tuberculosis (12.7%), heart attack (6.1%), cancer (4.8%), suicides (3.4%), acute abdomen (3.4%), burns (3.4%), anemia (3.3%) asthma (3.3%) and typhoid (3.1%).

Before 1975, population based studies of maternal mortality in the developing world were so rare that we continue to cite Lincoln Chen's study in Bangladesh in 1968-70 as a landmark. Even today, they are uncommon. However, they provide insights on levels and causes of maternal mortality which cannot be obtained from the easier-to-obtain hospital-based studies.

Studies in Bangladesh since 1968 show little evidence of change in maternal mortality rates. Researchers attribute the reduction in the maternal mortality rate in the Matlab study area more to family planning services than to improved obstetric services.

Given the importance and rarity of published studies on maternal mortality in the community, it is worth asking how these studies came about. Who did them? Who funded them? Of these 7 studies, 2 local studies in Bangladesh were financed by Ford Foundation for less than $10,000 each; the Matlab study has multiple international donor support. The Menoufia and Bali studies were financed by AID with technical support by Family Health International. The Addis Ababa maternal mortality survey was initiated by a Dutch nurse-midwife. And finally, the Anantapur study was supported, in part, by the World Health

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Organization. In short, all had some international financial support and virtually all had some international technical input. Most of these studies also had input from more than one type of professional, e.g., physicians, social scientists, field workers. This experience may provide objective rationale for developing recommendations for collaborative research.

Why do women die as a result of pregnancy? How well do we know the causes of maternal deaths? Overall, maternal deaths are classified as direct, indirect and non-maternal for women dying during or within 42 days after the end of a pregnancy.

The four most commonly identified direct causes in these community studies are hemorrhage, infection, eclampsia and complications after (non-medical) abortions.

The percentage distribution of causes of death varies between studies. This is due, in part, to the small numbers of deaths in each study and, in part, to the difficulty classifying these deaths due to any single cause. It is also due to the extend to which "indirect" and "non-maternal" deaths are included in the "other and unknown" category. And finally, it is due to real differences in local factors affecting different causes. A highly effective antenatal and safe delivery program may, for example, have little impact on mortality from septic abortion or ectopic pregnancy or post-partum pulmonary embolism. One Indian community with excellent community health care reported that two of three maternal deaths in the past year were due to septic abortion.

Even less is known about the prevalence of complications and the risk factors for the complications. One study, cited frequently because of its uniqueness, showed that for each maternal death, fifteen women had complications of pregnancy.

The complexity of social and biological causes of obstructed labor illustrates part of the complex etiology of maternal mortality and morbidity. Inadequate nutrition in childhood and early marriage contribute to structurally abnormal pelvis and multiparity contribute to weak uterine contractions, leading to high risk of prolonged or obstructed labor. Outcomes may be death from hemorrhage or infection or vaginal and/or rectal fistula. This situation may be exacerbated by other complicating health and social conditions. While prolonged and obstructed labor is not as severe a problem in India as in Africa, other causes of maternal death are equally complex and virtually all have a common solution.

Activities essential to prevent maternal mortality include the following:

Appropriate screening and monitoring during pregnancy.

Normal labor and delivery at home.

Transport to referral center for emergency during labor or delivery.

Pregnant women who are high risk of complications should be kept in waiting home close to and ready for delivery in a referral center.

Given the paucity of population-based on maternal mortality in India, I propose that special attention be given to improving the completeness of reporting in areas with sufficiently adequate health service delivery systems. To determine the overall level of maternal mortality in India, I can visualize no other approach than the demographer's survey.

For major urban areas, for blocks under guidance of medical school Preventive and Social Medicine Departments, and for geographic area with special inputs into health services (e.g., area projects, Integrated Child Development Scheme, CARE project areas, etc.) the collection of minimal maternal mortality data and birth data should be mandatory. Moreover, for each area, data collection should be coordinated between all relevant groups. For example, for urban areas, the Registrar General's office and state and municipal equivalent, the obstetrical or other medical association, any major funeral site might all be involved in detecting cases. For hospitals, emergency treatment areas, obstetrical, plastic, and surgery wards are all possible sites for maternal deaths. For each of these settings, efforts should be devoted to developing coordinated data collection and analysis which has specific objectives, such as providing medical practitioners with information useful to preventing deaths. Such a reporting system should determine trends, patterns, and risk factors. To determine risk factors one needs denominator data. For most of the proposed data collection areas, it is relatively easy to determine numbers of births and some minimal attributes of mothers giving births (e.g., age, marital status, parity, number of living children, place (block) of usual residence, month of birth). These few simple parameters, along with a few others for the deaths (date pregnancy ended and date and place of death, and probable cause(s) of death) are sufficient for a simple reporting system. The reports should include only attributes available for both births and deaths or attributes which assist in defining the cause of the death. Who should conduct such monitoring? Most importantly it should be someone committed to ensuring a high quality process, with ability to assess the quality of cause(s) of death, preferably with minimal analytic skills and access to a calculator or microcomputer.

The use of population based surveys to assess maternal mortality has been pioneered by Kwast and Liff. Their study in Addis Ababa was designed to determine both the level and the causes of maternal mortality. It required a fairly high intensity of high quality input into training and field investigations of individual deaths.

The other survey approach was designed by a demographer to obtain indirect estimates of maternal mortality levels, not causes, by asking women about deaths of sisters and the causes of deaths. This approach seems very practical for large scale surveys in India and should be pilot-tested.

In conclusion, a handful of good local population-based studies suggest that the overall patterns and levels of maternal mortality are consistent enough to develop strategies to apply appropriate training and technology to reduce mortality level by 80%.

Periodic overall estimates of mortality levels are required to determine if national programs are effective. In the absence of adequate vital registration system, demographic surveys may be useful for indirect estimates of maternal mortality levels.

For areas with moderately well developed obstetric services in urban and selected rural areas, health administrators should develop epidemiologic surveillance of maternal deaths and determine their medical, social, and behavioral causes.

Finally, given that obstetric services are the most common reason for hospital admission, special clinical and epidemiologic studies should be conducted on maternal morbidity and its control. This might also lead to reduced health care costs.

Overview of Determinants of Maternal Mortality

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INTRODUCTION

Most developing countries have a growing population which acts as a drag on economic and social development. However, an understanding of the socio-economic determinants of both fertility and mortality is absolutely indispensable for the proper formulation of not only population policies but also of economic plans. Yet there is a considerable gap in the knowledge of theory, methodology and determinants of fertility and mortality.[1]

Mortality research in the world, even though it gained momentum, lacked in-depth studies on mortality. The studies on mortality pattern from the rural areas are not available. However, maternal mortality has been considerably brought down in the last few decades, as per the urban records.

Because of incomplete registration, reports from an office of the Registrar General (of England) are accepted with reservation.[2] In India it is still more difficult. Information on obstetric mortality in the community is still very limited and derives from a small group of field surveys carried out in recent years.[2] Maternal mortality reported by various groups varies (Table I) considerably but the Federation of Obstetrics & Gynecological Societies of India (FOGSI) collaborative survey in a few teaching hospitals is in the range of 7.3 per thousand.[3]

TABLE I

MATERNAL MORTALITY RATES IN INDIA[3]

SOURCE	RATE
Institutional Maternal Mortality: FOGSI Collaboration study of 1851 deaths (1978-79)	7.53 per thousand live births
Community Maternal Mortality	
a) Field Study of Urban Community in Maharashtra (1971)	4.6 per thousand live births
b) Field Study of Rural Community in Maharashtra (1971)	7.8 per thousand live births
c) Field Study of Rural Community in Palghara Maharashtra (1969)	4.5 per thousand live births
d) Field Study of Rural Community in United Provinces (1975)	10.15 per thousand live births

The striking difference in the mortality rates (less than one per thousand births) between the privileged class of people with 90% trained attendance in contrast to very high mortality rates (around 10 per 1000 births) among the less cared for community is a social injustice.

If institutional care is provided properly, the unacceptable losses can be prevented as can the obstetric complications at the primary level. There must be earlier predictions of these mothers most at risk, earlier recognition of obstetric morbidity when it arises, and facilities within reach which enable the referral for timely intervention before irreparable harm is caused to the mother or the foetus.[2]

The higher rates of maternal mortality especially in rural areas is a result of direct consequences of the vicious cycle that have been formed in the health care delivery system. Ignorance on the part of the community to utilize MCH service, lack of communication and transport and shortage of manpower in the basic unit of the infrastructure of the government programme, i.e., subcenters, are the unresolved problems facing the community leading to high mortality rates.

Definition

The maternal mortality rate of any country reflects on the medical professional standards in general and obstetric care in particular. At present we have no proper statistics to prepare an action plan to reduce the high maternal mortality rate. The chief causes of death remain the same for decades despite improved medical standards.

In the changed circumstances of this technologically progressing world we must critically look at the definition of maternal mortality rate. The definition that is accepted and used at present, "Death of any women dying of any cause while pregnant or within 42 days of termination of pregnancy per 100,000 live births" needs to be reviewed.

It is paradoxical that the denominator is number of live births and not number of total births. We, however, include all deaths occurring as a result of pregnancy or any associate condition. This is perhaps due to non-availability of proper statistics.

Maternal Mortality

Maternal deaths have decreased considerably during the last few decades in developing countries and remarkably in the United States of America (Table II).[2,4]

The increased rates in different regions and communities of the world are due to lack of antenatal care, absence of intrapartum services and inadequate health education, in addition to poor hygiene, malnutrition and illiteracy.

TABLE II

Maternal Mortality in the United States (1935-82)

Year	Maternal Deaths Number		Rates per 100,000 Live Births	
	U.S.	India	U.S.	India
1935	12,544		582.1	
1940	8,876		376.0	
1945	5,668		107.2	
1950	2,960		83.3	
1955	1,901		47.0	
1960	1,579		37.1	
1965	1,189		31.6	
1970	803		21.5	
1975	403	1,851 deaths[2] (1978-79	12.8	753[2] (1978-79)
1980	334		9.2	
1982	330		8.9	

The common causes of maternal mortality continue to be hemorrhages, hypertension, including eclampsia, anaemia and infections. The reduction in the rates have been attributed to multiple factors, such as the availability of blood transfusion, antibiotics, intensive care units, newer biophysical and biochemical techniques and advances in anaesthesia. Yet the decline in the number of deaths due to sepsis, toxaemia and hemorrhages has been associated with an increase in maternal mortality due to cardiovascular accidents, anaesthetic accidents and many indirect obstetric causes.

The fast development of super-specialties in the field of medicine has led to the already sparingly available qualified anesthetists to get trained themselves to cater to the needs of specialists, like urology, cardiovascular surgery, paediatric surgery, etc. This has resulted in too often inexperienced and unskilled individuals administering obstetric anaesthesia resulting in mortality but not reported to escape legal complications.

In large parts of rural India, obstetric emergencies due to obstructed labor, septic abortions and eclampsia still take a heavy toll of life (Table III and IV). In India besides the above factors, the high maternal mortality rate is due to large number of unbooked emergencies due to late referrals.

TABLE III

Study of Obstetric Emergencies & Maternal Mortality
(JIPMER Studies)

A.	Causes of obstetric emergencies		
	1. Haemorrhage	14%	15% of mothers die
	2. Toxemias	18%	
	3. Infections, Anaemic, etc.	38%	
B.	Causes of maternal deaths		
	1. Obstructed Labor	18%	1 out of 10 die
	2. Rupture uterus	9%	1 out of 10 die
	3. Eclampsia	12%	1 out of 10 die
	4. Hemorrhages, anaemia, etc.	61%	1 out of 10 die

TABLE IV

Causes of Maternal Deaths - JIPMER and INDIA

	JIPMER (1980-88)	INDIA[2] (1978-79)
Total no. of deaths	163	1851
A. Direct causes		
1. Sepsis [67]	41.10	28.4
2. Hemorrhage [29]	17.79	22.2
3. Toxemia [24]	14.72	9.89
4. Rupture uterus [13]	7.97	NA
5. Amniotic fluid embolism [6]	3.68	NA
B. Associated Causes [17]	10.42	26.15
1. Anaemia [4]		
2. Cardiovascular [7]		
3. Hepatitis [6]		
C. Unrelated causes [7] (e.g., Bronchial Asthma, Carcinoma cervix, acute renal failure, etc.)	4.29	7.35

Note: Figures in brackets are number of deaths.

Lack of knowledge for utilizing the existing MCH service on the part of the community and lack of motivated and committed medical and paramedical personnel result in late referrals in terminal stages. High prevalence of anaemia and infections add to the high incidence of mortality and morbidity. High maternal mortality and morbidity can be avoided by preventing occurrence of obstetric emergencies.[5]

Scope for the next decade and beyond

Safe motherhood initiative has been presented at Nairobi where an International Conference was held in 1987.[6] This year's State of The World's Children Report[6] under the headlines, "Maternal deaths Statistics of Shame," states that female life expectancy, literacy, school enrollment, contraceptive use, immunization levels, percentage of births attended by trained personnel and maternal mortality rates for each country shows a double disadvantage of being born poor and female.

The report further states that first there is a great deal that the family itself can do if today's information about 'safe motherhood' is made available. Families should know for example that the risks of pregnancy and childbirth

can be drastically reduced by regular check ups during pregnancy, trained persons attending at the time of birth, pregnant women getting more food and rest, spacing of births, nourishing of female children, as well as making them aware of high risk factors like maternal age, weight, oedema, bleeding, etc.

Thus the International Safe Motherhood Conference concluded that it should be possible to reduce the maternal mortality rates by at least half by the end of the century. The initiative continued only in the form of workshops, seminars and symposia finally culminating in recommendations. However, women have been dying in pregnancy and child birth since time began and maternal mortality is a critical problem that needs to be recognized by all.[7] Action must be taken to implement the recommendations which include the political commitment to reduce mortality, prioritization of maternal health care, bringing about changes in the laws of the land especially regarding the status of women, community participation, introduction of appropriate technology and promotion of operational research.

The answer for the above has already been drawn up by an earlier Task Force on Minimum Perinatal Care,[8] which has still not been implemented. The term "perinatal period' and the concept of "perinatal care" was introduced in the late 40s by Peller, a pioneer in the field. It was based on the fact that the fetus and the newborn to a large extent reflect the effects of the influence of maternal, social, biological and cultural factors in-utero environment and the stress to which the newborn was subjected during the passage through the birth canal. These factors can influence all patients, both at risk or otherwise, delivered at home or in institution.

For strange reasons, the concept of "perinatal care" has not been developed, practiced or propagated in our country. It is well known that 80% of the births take place at home, either unattended or attended, by so-called trained traditional birth attendants. The existing MCH facilities are also not being used. The care of the newborn is practically negligible at all levels.

In order to make a beginning and create an awareness about the concept of perinatal care among both medical and paramedical personnel and the community, the Government of India has constituted a task force on minimum perinatal care which submitted its reports in 1982. The task force set the following as its objectives:

1. Define the minimum perinatal care in the existing set-up at the point of first contact.
2. Assess the training needs at all levels of health workers (Dai to Doctor)
3. Develop a model of perinatal care within the existing health set up.
4. Suggest appropriate modifications in perinatal care in the existing system.

It recommends that minimum perinatal care should be imparted through adoption of 'at risk' approach and the three level system of perinatal care. These methods will help to categorize the pregnant mothers and newborns into low risk and high risk with the corresponding level of care into primary (level-I), secondary (level-II) and tertiary (level-III).

India has one of the finest infrastructures laid down in her health care delivery system. But unfortunately they have remained mainly symbolic. Reactivation of primary health centers, at least those 100 and odd centers managed by medical colleges, all over India in the next decade will initiate the process of proper health care which will reduce the mortality at least by 50% if not more.

With firm conviction and commitment, the Government of India succeeded in the Green Revolution, White Revolution and conquered the space and sea (Antarctica) within a short period of time. The Government, therefore, can achieve the minimum perinatal care needed for India in the existing infrastructure of health care, if desired.

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LEAD DISCUSSION

Usha R. Krishna

Most developed countries use the perinatal mortality rate as an indicator of efficiency of obstetric services. However in our country, the maternal mortality is still high. Our socioeconomic standards, antenatal and intrapartum care, efficiency of administration and obstetric services are responsible factors. Poor transport, communication and lack of knowledge and awareness of the health delivery system are often more important.

Dr. Bhaskar Rao had studied 245,767 deliveries in 1978-79 in 27 centers. This FOGSI study showed a maternal mortality rate of 753/100,000. ICMR multicenter study on maternal mortality (1982-84) had 133 maternal deaths in 32,812 deliveries, a maternal mortality rate of 405/100,000. It is important to note that this rate is as low as 4/100,000 in developed countries. A major proportion of maternal mortality has been in unbooked cases in practically all studies. Amongst the direct causes of death in Dr. Rao's study, the leading causes were sepsis in 28.04%, hemorrhage during pregnancy and delivery in 22.2%, toxaemia of pregnancy in 9.89% and thromboembolism, etc., in 6.36%. Abortion with sepsis was by far the most important cause in this group responsible for one out of four deaths. Amongst the associated causes, jaundice in pregnancy, anaemia complicating pregnancy and cardiovascular disorders were leading medical complications. The unrelated causes were pulmonary tuberculosis, gastroenteritis, meningitis, malaria and amoebic infections. One out of ten deaths were in teenagers and 13% were primiparas. In the ICMR study (1983-84), the leading causes of maternal mortality were sepsis in 17.3%, hemorrhage in 12.8%, eclampsia in 12%, and rupture of the uterus in 8.3%. Hepatitis and heart disease were responsible for maternal deaths in 16.5% and 6% respectively. The Muslims had a higher maternal death rate (6.10/1000) as compared to Hindus (3.9/1000) and women belonging to other religions (2.8/1000). Amongst spontaneous vaginal deliveries, the maternal mortality was 1.52/1000 and amongst breech deliveries 2.77/1000, operative deliveries, i.e., vacuum and forceps, 4.22/1000 and cesarean section, 8.11/1000 indicating the seriousness of decision making when an obstetrician opts for operative delivery.

These figures were analyzed in relation to education. The death rate in illiterate women was 7.8/1000 as compared to .76/1000 in women who had a good level of education. This difference is due to the level of education and socioeconomic levels. The maternal mortality rate was higher in women above 35 years and in women below 19 years. The future maternal mortality research, therefore, needs to have in-depth studies and operative research studies where, although the ultimate cause of mortality may be hemorrhage or sepsis, one needs to go into the details of factors which lead to this catastrophe. Lack of antenatal care, untrained birth attendants, lack of proper reference for high risk cases, poor maternal child health facilities in the peripheries, lack of transport and communication, prevalence of anaemia and infections, and delay in admissions are the factors to be looked into in great detail and action taken to rectify each of them. There is such a striking difference in the mortality rates in the privileged and educated class compared to the less cared community. Ignorance on the part of the community to utilize the existing MCH services and lack of communication and transport, as well as shortage of

manpower in the basic unit of the infrastructure of the government's programme, are practically unresolved problems.

Women's education is the most important determinant of their own health and that of their children. Educated women tend to marry later, practice family planning, have fewer children with wider spacing and avail themselves of antenatal and intranatal care. Even the global review of maternal mortality shows that the maternal mortality is highest in Africa, i.e., 2000/100,000 live births in some rural areas. In Asia it varies from 55/100,000 in well developed areas such as Singapore to 650/1000,000 in poorly developed areas indicating that it is not the geographical location, but education and awareness of the health delivery system. It is very important to emphasize in our country that abortion related deaths are very high and almost avoidable.

There have been many symposia and meetings culminating into recommendations. All have recognized the importance of commitment to reduce the mortality by giving absolute priority to maternal health care, improving the status and education of women, getting community participation, improving transport and communication, as well as infrastructure of PHCs.

A good record system and continuous training of health care personnel, especially birth attendants, along with awareness of a high risk referral system is mandatory. Lastly, the availability of hospital beds, blood for transfusion, antibiotics, drugs, ICU facilities, and newer technologies and advances in anaesthesia will further reduce the maternal mortality. The commitment to achieve this should be at all levels.

The Effect of Maternal Nutrition on Infant Health in Developing Countries

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THE LOW BIRTHWEIGHT INFANT

Birthweight (BW) is perhaps the most important indicator we have of neonatal and infant survival, growth and development. As a universal indicator, it can be used to describe the health, nutrition and socioeconomic status of populations in both developed and developing countries. Tables 1 and 2 of published birthweight-specific neonatal and infant mortality rates show that up to two-thirds of all neonatal deaths and about half of all infant deaths in both developed and developing populations occur in infants weighing <2.5 kg (low birthweight; LBW). Moreover, LBW infants have a higher risk (2.3 90% CI 1.6-3.4) of mortality due to infection than infants of normal birthweight[1] (≥2.5 kg) even after controlling for confounding variables. Finally, birthweight is one of the determinants of duration of breast feeding,[2] a factor well-known to protect against infant mortality.

TABLE 1
Birthweight Specific Neonatal Mortality Rates

Region	Birthweight (kg)[1] Mortality Rate <2.5	≥2.5	Relative Risk <2.5 kg/≥2.5 kg	LBW[2] Rate (%)	Attributable Risk (%)
New Delhi (India)	53.8	5.1	10.5	23.0	68.7
S. Maria Cauque (Guatemala)	78.1	7.9	9.9	41.7	75.6
Latin America (hospitals)	135.8	4.0	33.9	9.2	75.7
U.S.A. (5 regions)	94.2	2.7	34.9	6.1	67.4

[1]per 1000 live births
[2]LBW = birthweight <2.5 kg

Sources: Mata, LJ. The children of Santa Maria Cauque: A prospective field study of health and growth. Cambridge, MA: The M.I.T. Press, 1978.

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Regionalized Perinatal Services, Special Report No. 2. Princeton, N.J.: Robert Wood Johnson Foundation, 1978.

TABLE 2
Birthweight Specific Infant Mortality Rates

Region	Birthweight (kg)[1] Mortality Rates <2.5	≥2.5	Relative Risk <2.5 kg/≥2.5 kg	LBW Rate (%)	Attributable Risk %
New Delhi (India)	100.7	19.9	5.0	23.0	48.2
S. Maria Cauque (Guatemala)	161.8	47.9	3.4	41.7	49.8
U.S.A. (5 regions)	113.2	6.5	20.0	6.1	53.9

[1]LBW = birthweight <2.5 kg

Sources: Mata, LJ. The children of Santa Maria Cauque: A prospective field study of health and growth. Cambridge, MA: The M.I.T. Press, 1978.

Regionalized Perinatal Services, Special Report No. 2. Princeton, N.J.: Robert Wood Johnson Foundation, 1978.

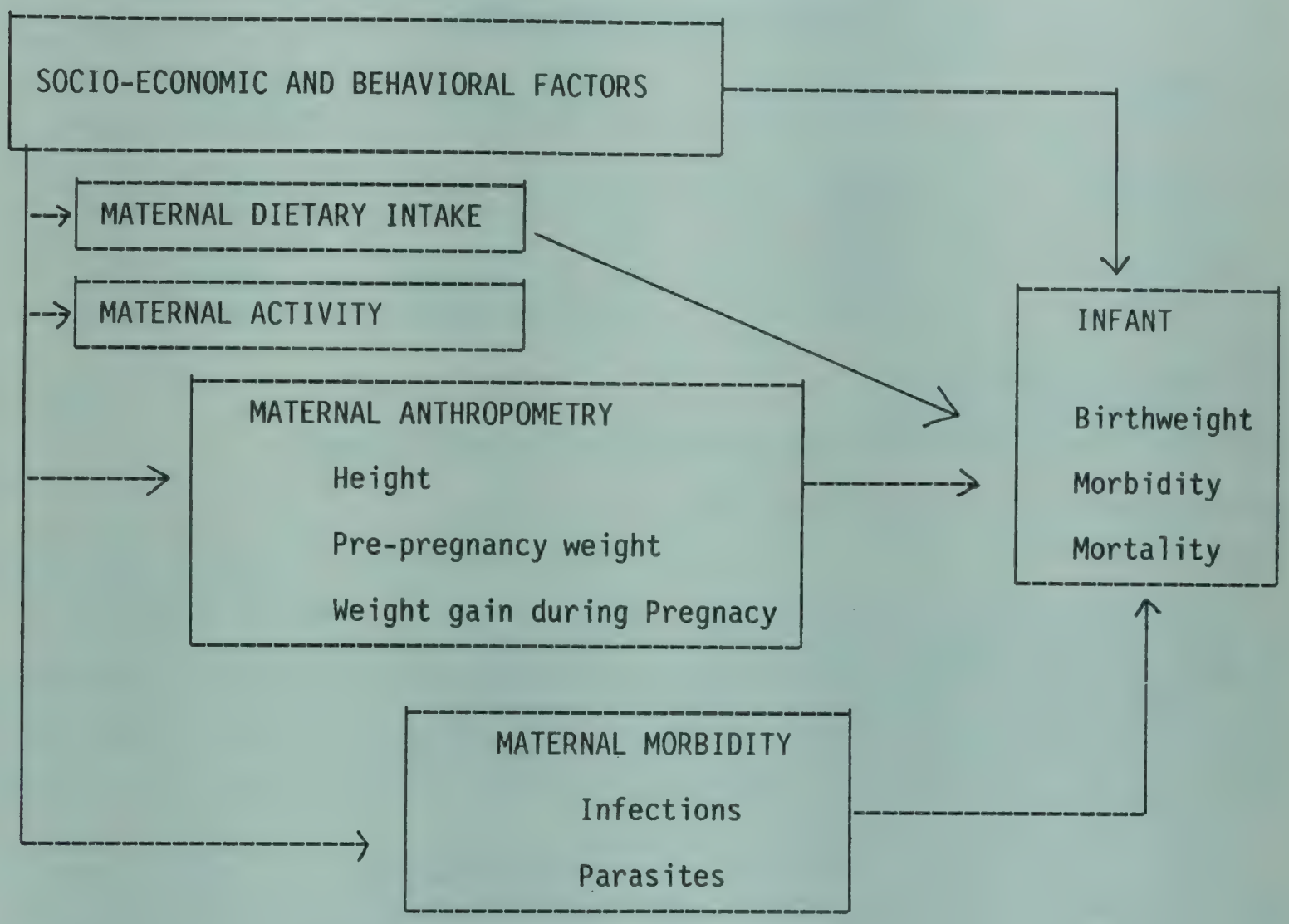
In 1979 the World Health Organization[3] evaluated birthweight data from 90 countries (where it is estimated that in one year 90% of all births in the world occur) and found that 17% of the infants were low birthweight; in developed countries that year, 7% of all infants born were LBW.

Low birthweight babies are a heterogeneous group, comprised of at least two major subgroups: a) preterm infants born before week 37 of gestation and, b) term babies born ≥37 weeks of gestation, who are ≤10 percentile for gestational age of a sex-specific standard from a well nourished population; these infants are usually referred to as intrauterine growth retarded (IUGR) or small-for-gestational age (SGA). Comparisons among several populations have demonstrated that IUGR infants comprise the largest component of LBW births in developing countries.[4,5]

Among intrauterine growth retarded neonates there are those whose weight-for-length ratio (rohrer index = wt/ht^3) at birth is low and others whose weight is adequate for their length. These anthropometric differences are associated with the timing of the insult during gestation[6] and are related to different short- and long-term health outcomes. Thus classification of IUGR infants by the rohrer index helps to understand the etiology of growth retardation and possible preventative interventions.[7]

The variety of factors that cause low birthweight are socio-economic, behavioral, medical and nutritional in nature. Figure 1 shows a schematic model of the determinants of infant health focusing on maternal factors. Here we limit our discussion to the effect on infant birthweight of the following maternal nutritional or nutrition-related factors: (1) pre-pregnancy weight, (2) height, (3) weight gain during pregnancy, (4) energy intake, and (5) physical activity pattern.

Figure 1



(1) Pre-Pregnancy Weight

Maternal pre-pregnancy weight has consistently been reported to be associated with birthweight. This association exists even when other important determinants of birthweight are accounted for, such as maternal height and weight gain during pregnancy, and infant gestational age and sex. These findings have been summarized recently by Anderson et al.[8] for a Canadian population and by Kramer[9] in an in-depth review of the determinants of LBW in developed and developing countries. The relationship between pre-pregnancy weight and birthweight is positive, and the approximate magnitude of the relationship is on the order of 10 grams of birthweight per added kilogram of the woman's pre-pregnancy weight.[9]

Data from a prospective longitudinal study of risk factors associated with pregnancy outcome conducted between 1984-86 in an urban population in Guatemala

City (N = 16,850) also demonstrate that pre-pregnancy weight is independently associated with birth outcome. Table 3 shows that the risk for delivering a LBW infant is significantly higher for women weighing <47 kg in early pregnancy than it is for women weighing between 52-55 kg, after adjusting for height and weight gain during pregnancy (adjusted odds ratio 1.7 95% CI 1.1-2.7).[10]

TABLE 3
Relationship Between Maternal Weight at the Time of the First Visit[1] and Incidence of Low Birthweight[2]

Guatemala City 1984-1986

Weight (kg)	N	Crude Odds Ratio	Adjusted[3] Odds Ratio
<47	1035	2.1 (1.6-2.9)	1.7 (1.1-2.7)
48-51	1057	1.2 (0.8-1.6)	1.1 (0.8-1.7)
52-55	956	1.0 --	1.0 --
56-60	1009	1.1 (0.7-1.5)	1.2 (0.8-1.8)
>60	1052	0.9 (0.7-1.4)	1.2 (0.7-2.1)

[1]<26 weeks of gestation
[2]Low birthweight = <2.5 kg
[3]Adjusted for weight gain during pregnancy and maternal height

Adapted from Villar J and Kestler E[10]

We examined the effect of maternal weight before 20 weeks of pregnancy on the incidence of infants small-for-gestational-age in a subsample of the Guatemalan population[10] referred to above. Women in the heaviest quintile of body weight had the lowest rate of SGA infants (11%), while those in the highest group had a rate of 25%. It should be noted that the 10% incidence of SGA in the heaviest group is the same as in the well nourished population used as the reference to classify a birth as SGA.

Finally, we have just completed a prospective longitudinal study of body composition changes during pregnancy and its effect on birthweight in our Perinatal Nutrition Unit in Guatemala.[11] As is shown in Table 4, maternal weight before 16 weeks of pregnancy was significantly associated with birthweight (for each kg of maternal weight above the group mean, an additional 15-18 gm birthweight was added) after controlling for weight gain or its two main components, fat and fat free mass. These data support what others have found: that low pre-pregnancy and early gestational weight are independent risk factors for birth of infants who are low birthweight and small-for-gestational-age.

TABLE 4
Regression Coefficients (SE) of the Relationship
Between Maternal Weight and Weight Gain
During Pregnancy on Birthweight

Guatemala City 1984-1986

Weight Components	Birthweight increase (g)	Pr |T|
Total weight gain (100 g/w)	132.8 (30.6)[1]	0.001
Early (<16 w) weight (Kg)	18.2 (4.6)	0.0001
Body fat gain (100 g/w)	166.2 (40.5)	0.001
Early (<16 w) weight (Kg)	14.9 (4.5)	0.001
Fat free mass gain (100 g/w)	202.2 (60.8)	0.001
Early (<16 w) weight (Kg)	17.1 (4.7)	0.004

[1]N = 104

Source: Villar J, et al.[11]

(2) Maternal Height

There is good evidence now that, after controlling for the potential confounding effect of gestational age, sex, pre-pregnancy weight, weight gain during pregnancy, and other variables, there is an independent association between birthweight and maternal height.[12,13,14,15] The relationship between maternal height and the incidence of SGA infants in the Guatemalan population referred to previously was dramatic.[10] Thirty six percent of chronically malnourished mothers (height $\leq$147 cm) delivered SGA infants, while only 14% of the women over 147 cm delivered SGA infants. Compared to women with a height of >158 cm, those <146 cm had a signficantly higher risk for delivering SGA infants (O.R. = 1.6 CI 95% 1.2-2.2).[10]

Because maternal height is associated with poor birth outcome, it is an attractive variable to incorporate into a risk scale, particularly in populations with poor prenatal care; it can be obtained at any time during pregnancy, not early on in the pregnancy as is the case with weight gain.

Of great interest for populations from developing countries is the possible interaction between chronic maternal malnutrition, measured as short stature, and parasitic infection during gestation. We have recently studied this effect in the subsample (N=14,914) of the urban Guatemalan population for whom we had stool samples and data on birthweight and gestational age.[16] Twenty-six percent of these women had at least one pathogenic species in their stool. We observed no effect on SGA of the number of parasitic species among women with a height above 147 cm. Conversely, there was a significant increase

in the incidence of SGA when 1 or ≥ 2 parasitic species were present (p value for trend <0.01) in short (<147 cm), chronically malnourished women. Presence of Ascaris lumbricoides, Strongyloides stercoralis, Trichuris trichiura and Entamoeba histolytica significantly increased the risk for an SGA birth among these women, independent of sanitary conditions at home and maternal education, weight and hematocrit. After adjusting for these covariates, short women infected with two or more species had a relative risk for SGA of 1.4 (95% CI 1.1-1.8) compared to uninfected short women. Parasitic infections among these undernourished mothers can be attributed to up to 10% of the intrauterine growth retardation incidence in the total population (Table 5). Attributable risk figures for several other known risk factors, recently published in a comprehensive report on low birthweight etiology,[9] are lower or close to 10%.

TABLE 5
Attributable Risk of Parasitic Infections for Small-For-Gestational-Age Births Among Chronically Malnourished Mothers[1]
Guatemala City 1984-86

Parasitic Infection	Proportion of the Population Infected %	Crude Relative Risk (CRR)	Attributable Risk (%)[2]
ANY PARASITE			
1 Specie	36	1.2	7
2 Species	10	1.3	3
Entamoeba histolytica	4	1.5	2
Ascaris lumbricoides	16	1.5	7
Trichuris trichiurae	5	1.9	4

[1]Malnourished mothers: height ≤ 147 cm.
[2]Attributable Risk = $\frac{\text{Proportion infected (RR-1)} \times 100}{1 + \text{Proportion infected (RR-1)}}$
Source: Villar J, et al.[16]

(3) Maternal Weight Gain During Pregnancy

Weight gain has been shown in a variety of contexts to affect birthweight, but not duration of gestation.[9] The relationship between weight gain and birthweight was also examined in our prospective study of body composition during pregnancy.[11] Healthy pregnant women with the first prenatal care visit before 16 weeks of gestation had a total weight gain at term (≥ 37 weeks) of 9.9 kg (SE 0.35 kg) with a net weight gain [1st trimester weight - post partum (>1 week)] of 4.8 kg (SE 0.40 kg). This population had a mean (± SD) birthweight of 3211 (± 467) and gestational age of 39.2 weeks.

Fat deposition patterns, defined by several skinfold measures, were very similar to the ones reported for a population from a developed country.[17] Up to term, there was an almost linear increase in fat deposition in the thigh and subscapular regions. As is presented in Table 6, women with low net fat

deposition (postpartum fat) in the thigh region had a three-fold higher risk for an SGA birth than women with the highest thigh measurement.

TABLE 6

Maternal Anthropometric Measurements and Risk for Small-for-Gestational-Age Birth

Odds Ratios (95% CI)
Comparison Between the Lowest and Highest Quintiles
Guatemala City 1984-86

Anthropometric Measurements (mm)	Odds Ratio	95% CI
Triceps skinfold	1.3	0.7-2.6
Subscapular skinfold	1.4	0.7-2.7
Suprailiac skinfold	1.1	0.6-2.2
Thigh skinfold	2.9	1.5-5.6
Arm circumference	1.8	0.9-3.6
Thigh circumference	2.9	1.5-5.7

Adapted from Villar J, et al.[11]

Several studies conducted in developing countries, including India, show that pregnant women gain in the range of 7-8 kilos.[18] Negative effects of poor weight gain on birth outcome have been documented in several studies including those from poor populations in developed countries. Horon and coworkers,[19] for instance, found that women who gained less than 9 Kg gave birth to infants who weighed 120 gm less at birth than did women who gained more than 9 Kg during pregnancy. Other studies have examined the joint effect of low pre-pregnancy weight and inadequate weight gain on post-natal events. The extremely high incidence (up to 60%) of low birthweight infants born to underweight women experiencing low weight gains during pregnancy is shown in Table 7. Brown et al[20] and Naeye[21] have shown that low pre-pregnancy weight and inadequate weight gain during pregnancy (<20 lb at term) is associated with an increase of LBW of up to 50% as well as with a perinatal mortality rate as high as 155 per 1000 births.

TABLE 7
Percentage of Low Birthweight (LBW) Infants Born to Underweight Women
By Level of Pregnancy Weight Gain at Term

Pregnancy weight gain at term (kg)	Percentile[1]	Percentage LBW[2]
>3.5	<3	60.0
3.5-4.5	3-5	33.3
4.5-6.5	5-10	30.3
6.5-8.0	10-16	15.6
8.0-11.0	16-25	12.7
11.0-12.5	25-50	12.6
12.5-14.0	50-75	12.6
>14.0	>75	6.8

[1]Based on 7061 white mothers with prepregnancy weight between 50 and 60 kg.

[2]Black population with prepregnancy weight less than 46 kg (N = 934).

Adapted from: Letchtig A, Klein RE. Guia para interpretar la ganancia de peso durante el embarazo como indicador de riesgo de bajo paso al pacer. Bol Of Sanit Panam 1980;89:489-95.

Edwards et al[22] showed that even if underweight women have an adequate total weight gain, as well as adequate rates of gain by trimester, their incidence of LBW is still two fold over women with normal pre-pregnancy weight. Conversely Naeye[21] showed that among women with widely varying pre-pregnancy weight, the perinatal mortality rates were lowest among women who gained at least 13.5 Kg, suggesting that the negative effect of prior poor nutritional status can be overcome with intrapartum interventions. Unfortunately this study did not take into account birthweight, an important confounding factor in the relationship between weight gain and perinatal mortality. In fact, when the relationship between BW and weight gain is analyzed potential confounding factors such as pre-pregnancy weight and gestational age should be controlled so that the independent effect of weight gain on birthweight can be estimated.[12,23,24]

An important public health question is: what is the desirable weight gain that reduces to a minimum the nutritional risk of a LBW infant? This question can be answered more confidently now as the result of three lines of study:

First, a desirable weight gain can be estimated on the basis of total weight gain measured during normal pregnancies. In both developed and developing countries normal patients with normal birthweight infants usually

gain on average 10.9 kg (24 lb). Second, desirable weight gain can be estimated on the basis of the relationship between mother's weight gain and birthweight of the infant. On the whole, increased birthweight is directly related to increased weight gain during pregnancy.[23] Third, a desirable weight gain can be calculated from the average weight-identifiable components of normal pregnancy (factorial method). The average weight at term of the fetus, placenta, amniotic fluid, and uterus plus added breast tissue, maternal blood, and intestinal fluid is estimated to be 9.15 kg (20.1 lb).[25] If 10.9 kg (24 lb) is the average weight gain, then 1.75 kg (3.85 lb) must be accounted for. The remaining weight is probably a measure of maternal storage of nutrients, particularly fat, though there is recent evidence of fat free mass storage as well.[11] In planning a diet for a healthy pregnant woman, the extra 1.65 kg (3.5 lb) may be considered a margin of safety. Each of these approaches suggests a desirable weight gain of at least 10.9 kg (24 lb). The use of new methods to study body composition, such as deuterium and body impedence analysis (BIA), should help to describe the pattern of fat deposition during pregnancy and therefore to understand the timing and amount of gain associated with good reproductive outcome.[11,18,26]

(4) Energy Intake

The association between energy intake and birthweight must be analyzed separately in well-nourished and mild-to-moderately malnourished women because in the former group diet fails to explain a statistically significant portion of birthweight variability,[27] whereas in the latter it does.[28,29] A number of intervention studies have been implemented to test the effect of nutritional supplementation on birth outcome. Reviews of these nutritional interventions (energy, protein or other nutrients) have been published by Susser,[30] Lechtig and Klein[31] and by Rush[32]. Appendix I of this document presents a summary of these publications from Villar and Gonzales de Cossio[33] who concluded the following on the basis of those studies:

1. Maternal supplementation has a positive effect on birthweight, which is more dramatic the more malnourished the mother is before pregnancy. For example, infant birthweight increased up to 458 gm when very malnourished mothers in India were given supplements.[34]

2. The effect on birthweight of nutritional supplementation during one pregnancy in well nourished or moderately malnourished women has consistently been found to be rather modest, with an average increase of less than 100 gm.

3. Data from Guatemala[36,37] suggest that energy may be the limiting dietary factor in fetal growth.

4. The New York study[27] showed that among women with adequate protein intake, high protein supplementation is associated with an increase in preterm birth and neonatal mortality.

5. Nutritional supplementation during pregnancy is associated with a reduction in the incidence of LBW in developing (Guatemala)[36,37] and developed populations (Special Supplemental Food Program for Women, Infants, and Children in the United States).[38]

The limited impact of nutritional supplementation on birthweight that is observed (average 100 g increase) may be explained by the characteristics of the population studied. First, it is possible that the LBW in some populations was not all due to nutrition, or that the women were not at high nutritional risk. Second, the full effect of the supplement may not have been obtained because not all women in these studies took all the supplement. Thirdly, most research projects were conducted in developing countries, where moderate, yet chronic malnutrition is wide-spread among poor women. Perhaps it is unrealistic to expect that the nutritional handicap developed during many generations can be overcome in a period of three to five months of modest nutritional supplementation initiated only after the onset of pregnancy.

If chronically and moderately malnourished women are supplemented during longer periods, there could be a greater and biologically more significant improvement in infant birthweight than previously reported. For example, Villar and Rivera[45] analyzed the impact on chronically, yet moderately malnourished, women of nutritional supplementation during two consecutive pregnancies and the intervening lactation period (Table 8). Birthweight of the second offspring was the outcome variable. Groups were divided according to the levels of energy supplementation in the three periods. The adjusted mean birthweight of the second offspring of women with high supplementation during the complete period (about 110 extra Kcal/day) was up to 301 g greater than that of the offspring born to the low supplementation group. Women with high supplementation during the lactation and second pregnancy periods had babies up to 150 g heavier than the reference group; those mothers with high supplementation only during the second pregnancy had infants about 124 g heavier than those of the low supplementation group (Table 8). Thus, this study showed that nutritional supplementation of chronically but moderately malnourished women during two consecutive pregnancies and the intervening lactation period can increase the mean birthweight by a value three times higher than that shown in many of the previous reports on this topic.[32]

TABLE 8

Crude and Adjusted Birth Weight of Second Offspring for Four Supplementation Groups: Level of Supplementations as Total Caloric Intake*

Supplementation Group (1st Pregnancy-Lactation-2nd Pregnancy	Unadjusted Analysis		
	n	Mean (g)	SD
High-high-high	21	3,290**	514
Low-high-high	55	3,105	474
Low-low-high	27	3,056	378
Low-low-low	50	2,944	501

Supplementation Group (1st Pregnancy-Lactation-2nd Pregnancy	Adjusted Analysis (Mean Differences from LLL Group)					
	Parity, Maternal		Parity, Maternal Height, and Gestational Age 2nd Pregnancy		Parity, Maternal Height, and Birth Weight 1st Infant	
	Mean	SE	Mean	SE	Mean	SE
High-high-high	301**,****	123	267**,****	123	246**,****	157
Low-high-high	150***	91	113***	94	193***	123
Low-low-high	124	112	100	112	202	163
Low-low-low						

*High, high supplementation >20,000 kcal pregnancy, >40,000 kcal lactation; Low, low supplementation ≤20,000 kcal pregnancy, ≤40,000 kcal lactation.
**P < .05 (test for linear trend)
***P < .05; one-tailed
****P < .025 compared with LLL group

Source: Villar J and Rivera J[34]

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(5) Physical Activity

Physical activity may affect birth outcome either because it: (1) increases energy expenditure and therefore requirements; (2) reduces blood flow to the fetal-placental unit, (3) creates stress, or (4) increases the risk for maternal morbidity during pregnancy.

In areas with seasonal variation in work activity, energy expenditure can be expected to vary by season. Pregnant women have been documented to lose

weight and fat in seasons of high demand for agricultural work, although seasons of high physical demand often coincide with periods of low food availability and high morbidity.[18,46]

Some studies have examined directly the relationship between physical activity and birth outcome. While some studies show no effect of physical activity,[47,48,49] others conducted in such varying contexts as France,[50] Canada,[51] Ethiopia,[52] and Zaire[53] suggest that under certain circumstances physical activity may adversely affect not only birthweight but also duration of gestation. Table 9 shows the effect of physical work on birthweight in an Ethiopian population. Poor women with heavy physical activity had babies with lower BW, the difference being approximately 200 g when compared to women with similar socio-economic status and weight gain but without demanding physical work. Birthweight differences between the newborns of working versus non-working women in the same population increased to 489 g if the mother's pre-pregnancy weight was below 49 kg and the pregnancy weight gain was less than 4 kg.[47]

TABLE 9

Effect of Physical Activity During Pregnancy on Weight Gain and Birthweight Among Undernourished Mothers

Ethiopia 1977

Maternal Early Pregnancy Weight kg	Net Weight Gain (diff)[1] kg	Birthweight (diff)[1](kg) Total	Birthweight (diff)[1](kg) <4 kg weight gain net of fetus
<49	2.9	.20	.49
49-58	2.5	.16	.25
>58	3.6	.22	.29

[1]Diff = Mean of light work - mean of hard work
hard work: no servants or work out of home was strenuous
light work: servants with or without light work out of home

Adapted from: Tafari N, et al.[41]

In a study of the relationship between work and birth outcome among the urban Guatemalan previously reported on, we found that work inside and outside the home had adverse effects on birthweight and duration of gestation, after controlling for household income and maternal age, height, and previous birth history.[49] Women with three or more children and no household help were at significantly higher risk for an SGA baby compared to women with family help at

home (OR=1.79 CI 95%=1.31-2.47) or hired help (OR=2.0 CI 95% 1.16, 3.33) (Table 10). In the sub-sample of employed women (N=5280) intensity of work outside the home, as measured by an activity score, was also associated with birth outcome as Table 11 shows. Furthermore, as intensity of work increased, there was a significant increase in the proportion of infants born SGA/preterm (linear trend p=.002) and SGA (linear trend p=.001).

TABLE 10

The Effect of Household Work on the Risk of SGA

Adjusted[1] odds ratios (CI 95%)
Guatemala City, 1984-1986

	SGA[2] (N=3250)
No. Children	
≤2	1.0
≥3	1.17 (1.04-1.31)

	No. Children ≤2 (N=2667)	No. Children ≥3 (N=583)
Household help[3]		
Family help	1.0	1.0
None	1.03 (0.91-1.18)	1.79 (1.31-2.47)
Hired help	1.0	1.0
None	1.15 (0.95-1.41)	2.0 (1.16-3.33)

[1]Odds ratios adjusted for covariates: monthly per capita income and maternal age, height and birthweight of previous infant.
[2]Reference is normal birthweight group N = 12,061
[3]Excludes SGA n=42 who reported no household chores.

Adapted from: Launer LJ, et al.[43]

TABLE 11

The Effect of Activity Level at Work on Birth Outcome of Employed Women

Adjusted[1] odds ratios (CI 95%)
Guatemala City, 1984-1986

Activity Score[2]	Birth Outcome[3] SGA (n=1007)	SGA/Preterm (n=43)
Minimum[4]	1.19 (0.89-1.60)	1.26 (0.28-5.69)
Low	1.00	1.00
Moderate	1.53 (1.24-1.90)	1.84 (0.60-5.66)
High[5]	1.64 (1.29-2.08)	4.44 (1.47-13.37)

[1]Odds ratios (CI 95%) adjusted for covariates: monthly per capita income, maternal age, height, and birthweight of previous infant.
[2]Activity Score: Based on adjusted odds ratios.
[3]Reference is normal birthweight group: N=4,028.
[4]Minimum: office work ± sedentary, ± sitting position.
[5]High: manual work ± moderate/intense ± stand/walk ± 40+ hours.

Adapted from: Launer LJ, et al.[43]

CONCLUSION

In conclusion, we find that maternal nutritional factors influence birthweight; poor nutritional status is associated with decreased birthweight, which in turn increases the risk for infant morbidity and mortality. Going into pregnancy, malnourished women (low pre-pregnancy weight and height) have distinct disadvantages. On the basis of the information we have, the following recommendations can be made to improve the nutritional component causing LBW among women at high nutritional risk.

(1) Achieve adequate weight gain through increased consumption of energy rich foods.

(2) Decrease physical activity.

(3) Treat parasites prevalent in undernourished women.

Increased food consumption and/or decreased physical activity, however, require economic resources that are often beyond the reach of many poor women. Economic development, therefore, is an important component to improving the nutritional status and reproductive performance of poor women.

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Appendix I
Supplementation Studies

	New York[27]	Montreal[35]	Birmingham[39,40]	WIC[38]
Type of study	Random distribution, double-blind	Food given at dispensary	Not random; suppl. given to Asian mothers of 1 maternity	National level; food + education to women of low SES
Sample size (suppl. + nonsuppl.)	768	2426	142	788 (in this study)
Population	Poor black; previous LBW; protein-intake <50g/day	Low SES; inadequate diet	Suppl. given independent of nutritional status	High nutritional and economic risk; control for confounding
Anthropometry	<110 lb; low weight gain in pregnancy		± 155 cm ht, 54 kg weight (50th percentile)	Different for each study; no data
Supplement	Flavored drink to 2 groups + medical attention to all; real increase in intake;(1) 27 gm protein/275 kcal;(2) 4 gm protein/212 kcal;(3) no kcal, no protein; all received vitamins + minerals	Eggs, milk, oranges	(1) 30 mg vit. C + 30 mg Fe; (2) 1 + 273 kcal; (3) 1 + 2+ 26 gm protein	Milk, eggs, cheese, cereals with iron, beans, peanut butter, orange juice
Duration of suppl.	Before 30 weeks of pregnancy		Suppl. offered from 18-20 weeks of gestation	1st, 2nd, or 3rd trimester; no effect due to suppl. duration
Effect on:				
Mother	Increased weight gain in suppl. mothers; greater if early enrollment	Increased weight gain in suppl. mothers (0.3 lb; NS)	Increased weight gain in 2nd trimester (fat); increased increment in lighter mothers	Not studied
Birth weight	High-protein group: decreased BW by 32 gm; Low protein group: increased BW by 41 gm (both p >0.05)	40 gm (3251 vs. 3291 gm) (p <0.05)	Not equal between 3 groups; the lightest suppl. vs. unsuppl. difference in BW was 310 gm.	Increased 108 gm (80 gm adjusted for gestational age); increased 174 gm in adolescent mothers (<20 yr); 5.2% decrease in LBW
Prematurity	Increased premature births in high-protein group	5.7% in suppl.; 6.8% in control (NS). Difference in gestational age 0.4 days; NS	Not reported	5 1/2 days increase
Differential impact depending on sex	Not detected	No	No	Not reported
Adverse effects	Increase preterm, IUGR, neonatal mortality in high-protein group	None	None	Not reported
Others		Increased effect on 1st birth; increased effect on BW if pre-gest.weight was <140 lb (difference 53 gm vs. 40 gm)	No effect on well-nourished women	Increased effect on black, Hispanic, and adolescent mothers

	Mexico[41]	India[34]	Bogota[29]
Type of study	Supplement to pregnant women; analysis done by matching by weight, height, parity, health, SES	Poor women hospitalized given suppl; high SES and low SES used as controls	Random assignment to pregnant women
Sample size (suppl. + nonsuppl.)	80	32	385
Population	Suppl. women ate more than unsuppl. after controlling for suppl; mean intake before suppl. 1950 kcal/50 gm protein	Poor, low SES; diet before suppl.: 1400-1800 kcal/ 40 gm protein	Poor; women with at least 50% of children with 85% wt/age; diet before suppl.: 1600 kcal/35 gm protein
Anthropometry	144-156 cm height	45 kg w/o clinical signs of malnutrition	149.9 cm
Supplement	300 kcal/20 gm protein	At hospitalization women were given 2300 kcal/80 gm protein + bed rest	Dry skim milk; enriched bread; veg. oil; vitamins + minerals for the whole family; net increase 155 kcal/20 gm protein
Duration of suppl.	From last menstruation	From 36 weeks gestation	1st or 2nd trimester of gestation
Effect on:			
Mother	Increase increment in suppl. mothers (3.4 kg)	Not reported	Increased weight gain only in those bearing male fetuses
Birth weight	Increased 180 gm; 29.6% decrease LBW	Increased 458 gm	Increased 51 gm NS; only males, 95 ($p<0.05$); females, NS
Prematurity	Not reported	Not reported	No effect
Differential impact depending on sex	Not reported	Not reported	Selected effect only for males; no effect on females
Adverse effects	Not reported	Not reported	None
Others			Decrease neonatal and perinatal mortality in suppl. group (NS)

	Guatemala[36,37]	Taiwan[42,43]	Gambia[44]
Type of study	Suppl. to women of four communities; attendance voluntary; ad libitum intake (measured)	Random, double-blind	Suppl. to all pregnant women of community
Sample size (suppl. + nonsuppl.)	~ 405	506	274
Population	Poor, endemic malnutrition in community; high infection; previous mean intake: 1500 kcal/ 40 gm protein	Poor women with at least 1 son; previous mean intake: 1200 kcal/40 gm protein	Rural population; previous mean intake: 1480/1800 kcal during dry/wet season
Anthropometry	149 cm	?	?
Supplement	Ad libitum intake (measured) of calories and protein or of calories only	3 groups: (1) 800 kcal/40 gm protein, (2) 80 kcal/ 0 gm protein (3) nothing; medical attention to all	Groundnuts, biscuits, tea with vits; approx. 1000 kcal; 481 kcal net increase
Duration of suppl.	Any trimester (measured)	Pregestational and during entire pregnancy	Started before week 16; lasted at least 1 mo
Effect on:			
Mother	Increased weight gain; increased placental weight; increased RNAse activity; decreased postpartum amenorrhea; decreased interval between births	None (same weight gain)	Increased weight gain when supplemented
Birth weight	Positive effect; dose response; 29 gm increase 10,000 kcal suppl.; 10% decrease LBW; < 20,000 vs. > 20,000 kcal intake = 111 gm difference	Increased 42 gm in males; increased 63 gm in females; decrease % LBW in suppl.	224 gm difference mean pre-post suppl. (controlling for gest. age) in the wet season
Prematurity	Yes; no effect if enrollment only during 3rd trimester; 1.1 day/10,000 kcal; 1st vs. 3rd tercile of ingested suppl.: difference 1.4 wk	No effect	After vs. before suppl.: -0.33 wk in males; +0.65 wk in females (both NS)
Differential impact depending on sex	Not reported	No clear tendency	No difference
Adverse effects	Not detected (authors report under-registration and there could be bias)	None	None
Others			Effect only during wet season; no effect during dry season

NOTE: Offered supplements should not be completely added to habitual diet, because this decreases slightly as a result of the supplement (substitution effect). Some studies report the increment is the result of the supplement. This table contains the available information from the studies. SES = socioeconomic status.

Source: Villar J and Gonzales de Cossio[33]

OVERVIEW OF MATERNAL NUTRITION FACTORS AND INFANT MORTALITY

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It is widely recognized that infant and maternal mortality rates in a country reflect socioeconomic development, accessibility to health care and better nutritional status of the community. However, despite the fact that /0% of the population in India live in rural areas and about 60% of the population are below the poverty line among the rural folks, there is very little realization and concern about this problem. Only with the Alma Ata declaration of "Health for All" by 2000 AD by WHO, of which India is a member country, the concern of health planners has been directed towards reducing infant mortality[1]. After 1978 the relative high IMR in India, which was almost stable for a decade, has started declining. Table 1 gives the decline in IMR over the last decade.

Table 1

Infant mortality rate over a decade

Year	IMR Overall	IMR Rural	Urban
1976	129	139	80
1977	130	140	81
1978	127	137	74
1979	120	130	72
1980	114	124	65
1981	110	124	66
1982	105	114	65
1983	105	114	66
1984	104	113	66
1985	95	105	57

Source: Registrar, General of India

After the Alma Ata declaration in 1978, Government of India had adopted the national goal of halving the prevailing level of IMR from 120 to 60 by 2000 AD. The 6th, 7th and recent 8th Five Year Plans have laid a great emphasis to all the planners and agencies to ensure efforts to lower IMR and raise the level of child survival.

The 20 point programmes and its different versions depicting the high priorities of the Government have included a rapid improvement in the conditions of women and children as a key component.

Major factors determining infant mortality in a community can be broadly divided into three groups:

1. Health, nutritional status and care of mother in prenatal and natal period.

2. Availability of obstetric and perinatal care facilities.

3. Postnatal care of the infant.

The importance of the health and nutritional status of the mother in prenatal period will be clear if one realizes that more than 50% of infant deaths occur in the perinatal and immediate neonatal (< 28 days) period.

Table 2 clearly gives the trend in the IMR in relation to distribution of deaths during different periods of infancy from the perinatal period onwards.

Table 2 (A)

Neonatal (NNR) and Postneonatal (PNR) Mortality rates by Urban Rural Residence 1970-72, 1976-78, 1980-83.

	Neonatal Mortality			Post neonatal			IMR		
	U	R	ALL	U	R	ALL	U	R	ALL
1970-72	45	76.	72	40	65	61	86	141	132
1976-78	43	85.4	98	35	53	50	78	139	129
1980-83	39	74	68	31	43	41	65	114	105

Table 2 (B)

Percentage of Infant deaths to total deaths and neonatal deaths (NND)

	% of infant deaths to total deaths			% of NND to infant deaths		
	All India	Rural	Urban	All India	Rural	Urban
71-73	30	31	26	54	53	56
76-78	30	30	24	61	62	56
80-83	30	30	23	63	63	60

Maternal factors influencing infant mortality:

Socio economic status: Indicators of the health care and well being of a being of a society are reflected in the infant and maternal mortality. The socioeconomic status of a population has multiple ramifications leading to poor nutritional status of the mother which in turn is influenced by social and cultural practices. This also has an influence on the early marriage, early pregnancy and smaller body size of the mother. Dietary intake of pregnant women is in turn influenced by various factors. (Fig. 1).

FIGURE 1

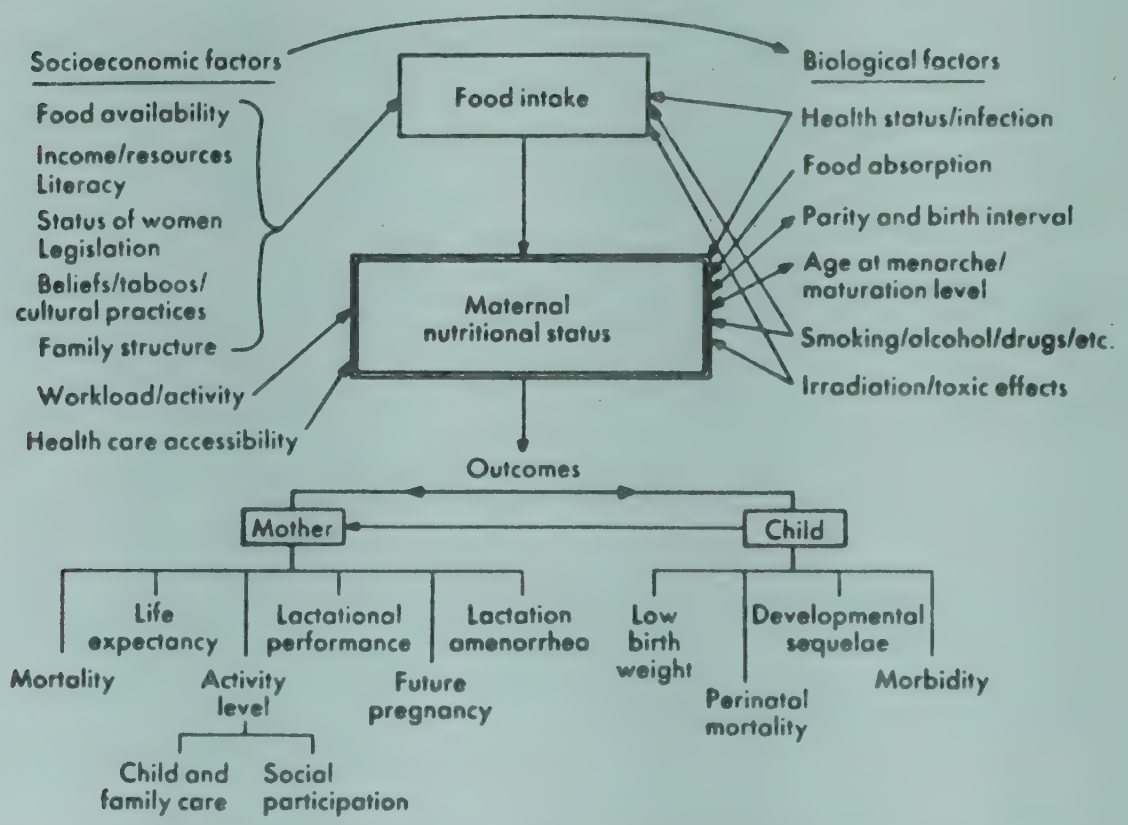

Fig. Influences on and outcomes of maternal nutritional status. (Modified from Hofvander, Y.: Maternal and young child nutrition. Paris, 1983, United Nations Educational, Scientific and Cultural Organization.)

The end result of the above complex interplay is seen in the poor nutritional status of the mother which has immediate and long term effects not only on the pregnancy outcome but also on the subsequent health status of the infant.

Age and parity of the mother

It is difficult to dissociate age and parity since with increasing age the parity of the mother also increases. It has been very clearly shown in various IMR surveys that both extremes of ages below 20 and above 30 years are associated with high IMR[2]. IMR actually shows a U shaped or J-shaped interrelationship with the age of mother as well as the parity. [3-6] In turn these two variables are highly correlated. The underlying factors are mainly biological and behavioral. The very young mother is biologically not fully mature and therefore has probability of having a higher incidence of pregnancy related complications. Various studies have shown high incidence of pregnancy induced hypertension and eclampsia, low birth weight, prematurity and Cesarian section with lower age[7]. Also a young mother, due to her inherent inexperience, may not be able to take proper care of the young infant. In poor socioeconomic groups 30% of primigravidas are teenagers. Also parity above 4 is seen more often (25-30%) in the same social class. In Indian situation there is a considerable support to primis from the kin group. This could be an asset as well as a major constraint. The traditional outlook, illiteracy and superstitions of old family members with respect to infant care, may not be conducive to infant health and survival. Beyond the age of 30 again the risk of pregnancy complications increase resulting in higher infant deaths. (Table 3A & B).

Table 3 (A)
Age of mother and early neonatal death

	Rate				
	Study Group				
	Agarwal Bihar	Kastrhurial Gulbarga	Puri Pondicherry	Rao T.N. R	U
15-19	39	58	60	49	38
20-24	28	40	37	42	31
25-29			30	35	25
30-34	76	107	24	43	27
35-39			57	45	54
40+			-	38	Nil

TABLE - 3 (B)

PERCENT DISTRIBUTION OF MOTHERS BY AGE

Age (yrs)	UTTAR PRADESH		TAMIL NADU		KERALA	
	High IMR	Low IMR	High IMR	Low IMR	High IMR	Low IMR
< 20	14.8	8.5	25.3	25.6	19.8	11.8
20 - 25	27.9	33.3	37.1	36.8	35.2	50.7
25 - 30	31.1	37.2	24.9	23.6	27.1	30.1
30 - 35	13.3	13.6	10.3	10.2	12.2	5.7
> 35	12.9	7.4	2.4	3.8	5.7	1.7
N	1633	1591	2197	1954	3285	3168
Mean	26.6	26.4	23.9	24.0	24.9	24.2
SD	6.13	5.17	5.16	5.40	5.58	4.14

Body weight and weight gain during pregnancy:

Poor nutrition during infancy and childhood is associated with lower body size in the mother. A consistent inverse relationship has been shown between maternal nutrition and infant mortality[8]. It is felt that this may be due to impaired placental nutrient supply resulting in decreasing fetal growth and obstetric complications from a contracted pelvis. It has also been shown that women who themselves had lower birth weight have been reported to a higher than expected incidence of poor pregnancy outcome than women with higher birth weight[9]. It is felt that with reduced birth weight, the growth and development of one or more systems may be interfered, which include reproductive and/or endocrine system. Thus it would be obvious that no matter how effective prenatal, perinatal and neonatal care becomes, such a care alone may not prevent some of the problems of pregnancy outcome.

The poor nutritional status of the mother also is associated with poor body weight and weight gain during pregnancy. A close association has been shown between the maternal body weight, weight gain and birth weight of the infant, i.e., the lower the body weight, the higher the incidence of low birth weight.

When both body weight and gain weight (a reflection of caloric intake during pregnancy) are poor, the incidence of low birth weight becomes even higher[10] (Table 4).

Table 4

Maternal body weight on mean birth weight and incidence of low birth weight (LBW)

Maternal body weight	Mean birth weight kg	% LBW (<2.5kg)
<40	2.65+0.05 (82)	37.8
41-45	2.8+0.04	22.4
45.1-50	2.80+0.04 (25)	24.4
>50	2.90+0.04 (106)	20.8

Values means ± SEMS (n)

A close association has been shown between infant birth weight and infant mortality[3,11,12,13] (Table 5).

Table 5

Neonatal death rate in relation to birth weight/1000 live births

	Study Groups			
	Bhandari Rajasthan	Ghosh Delhi	Karan H'bad	Kasturilal Gulbarga
< 1000	1000	971	619	1000
1000-1500	328	474	500	862
1501-2000		160	188	259
2001-2500	45	14	14	9
2501-3000	9	5	4	6
> 3000	6	7	-	-
Total	45	28	36	54
N	4161	7521	3651	1483

One may argue that body weight is related to the height of the mother and shorter mothers would also be lighter in weight. However a study on the body mass index has shown a close association between the low body mass and high incidence of low birth weight.[10]

Deficiency signs and anemia:

A mother who has poor nutrient intake is not only deficient in body weight (a reflection of poor caloric intake) but also suffers from higher incidence of other deficiency signs like B complex, vitamin A, etc., as well as anemia. Of all the deficiencies, anemia in pregnancy is the most important variable in terms of pregnancy outcome. A close association has been shown between the incidence of prematurity, low birth weight and perinatal mortality on one hand and the level of Hb on the other.[14] It is significant to realize that between 10-20% of women at any time of pregnancy have hemoglobin less than 9gm/dl which is conducive to poor reproductive outcome.[15] Anemia not only results in poor fetal growth due to lack of proper nutrient transfer across the placental but also results in acute or chronic hypoxia which in turn is responsible for intrauterine death as well as chronic growth failure in utero. Thus anemia either by causing intrauterine death or by resulting in premature or low birth weight infants would increase the perinatal mortality. As has been shown earlier more than 60% of infant deaths occur within the neonatal period which in turn are mainly related to maternal health and nutritional status.

Complications of pregnancies and maternal nutritional status:

While some of the complications of pregnancy, like threatened abortion, PIH, placental previa, are associated with high perinatal death rate, association of poor nutritional status, particularly anemia results in a much higher percent of perinatal deaths in PIH as compared to non-anemic PIH.[16] Also women with poor nutritional status suffer from severe complications especially in terms of PIH. Since the outcome and severity of PIH is also closely related to prenatal care, it is not always easy to establish a cause and effect relationship between maternal nutritional status and PIH.

Obstetric and antenatal care:

Poverty, malnutrition, illiteracy and poor health care coexist in any economically deprived society. With improvement in socioeconomic status, a definite improvement is seen in the nutritional status of the mother. Also improved socioeconomic status is associated with higher literacy status, as well as better utilization of health care facilities. A close relation between the educational status of the mother and the infant mortality rate has been shown in an extensive study of UP/Kerala, Tamil Nadu project[17]. It is observed that despite poor social status and relative maternal malnutrition due to awareness and demand of health services, infant mortality in Kerala is lowest (similar to any of the developed countries). On the other hand in UP and Punjab despite affluence and better availability of food especially in Punjab, the IMR is much higher. A close association between the literacy status and IMR is shown in the Table 6.

Table - 6
LITERACY LEVEL OF MOTHERS

Literacy level	UTTAR PRADESH		TAMIL NADU		KERALA	
	High IMR	Low IMR	High IMR	Low IMR	High IMR	Low IMR
Illiterate	92.8	83.2	66.0	52.5	51.8	0.6
Primary	4.6	9.9	18.0	26.4	27.2	8.9
Middle school	1.7	4.6	9.5	12.2	12.7	22.3
High school	0.7	1.5	5.9	8.2	7.5	58.8
College	0.2	0.8	0.6	0.7	0.7	9.0
Others	-	-	-	-	0.1	0.4
N	1633	1592	2200	1956	3285	3169

Thus it is clear that if only the educational status of the community, especially of women in particular, is improved, a significant reduction can be brought in the IMR especially in the post neonatal period. However, even in Kerala more than 60% of deaths are in the earlier neonatal and perinatal period indicating that unless there is also improvement in the health and nutritional status of the mother during pregnancy reducing this component of mortality will not be possible.

Causes of IMR

While in most states the commonest cause of early neonatal death has been prematurity, neonatal tetanus has been found to be most important cause of neonatal death in the states like U.P. where IMR is highest. A close association has been shown between the poor antenatal care, illiteracy and failure of immunization with tetanus toxoid during pregnancy.[18] It has been shown that hardly 20% of women in rural areas receive full protection against tetanus. Also a study [19] done on the immune response to tetanus toxoid has indicated that in women from poor social class even two doses of tetanus toxoid fail to raise the antibody titre beyond the protective level in 15-30% of mothers and infants. Significance of this would be obvious in rural set ups where the deliveries are conducted in unhygienic environments by untrained midwives. A study on infant survival [20] in Maharashtra has indicated that IMR was higher in women in spite of immunization with tetanus toxoid.

In the post neonatal period, after 3 months, mortality due to diarrhea becomes the major problem. This again is related to unpotable water supply, unhygienic environment in which the infant is left and repeated cross infections due to poor sanitation.

Postnatal health of the mother

While in the perinatal period various nutritional factors directly and indirectly have affect on the perinatal death rate, health and nutritional status of the mother in the postnatal period to a great extent may reflect on the post neonatal death rate. It is generally stated that despite gross malnutrition, most mothers in the poor community are able to breast feed their infants successfully. This is based on the average growth curves of the infants in the first 6 months of postnatal life. Also the prevalence of infant malnutrition as reflected on weight for height and/or age, would indicate that though the growth of the infant is satisfactory in first 3 months of infancy, the deviation in the growth curves becomes obvious between the 4th and 5th month and gets worsened by 6 months. [21] One may argue that similar observations are also seen in partially breastfed infants due to higher incidence of infection.

A close association has been shown between maternal body weight and the infant growth curve indicating that women with poor body weight are not able to lactate successfully beyond the age of 3 months and if supplements are not introduced in such infants early, these infants are liable for gross malnutrition in the later infancy[20]. Poor velocity of growth is associated with higher incidence of morbidity which in turn may reflect on the mortality rates in the postneonatal period. The poor social status in the postnatal period is associated with not only the poor health status of the mother, but also poor literacy resulting in improper introduction of weaning foods.

Due to the lack of knowledge, supplements introduced may not be adequate to meet the needs of growing infants. Also the hygienic conditions in which these women live, the improper care taken in preparation of weaning foods, the infant care left to other relatives especially older women or younger child in population where mothers go out for work, results in higher rate of infection and in turn the growth failure of the infant. Thus economically poor women are at a disadvantage either when they breast feed the infant for a long time resulting in insufficiency of breast milk for growth or when supplements introduced in inadequate amount under unhygienic environments, which has effect of infancy morbidity and mortality rates.

The scope for improving infant mortality in the next decade

As is seen all along the discussion the most important contributor of infant death is early neonatal and perinatal period. This is directly related to the health and nutritional status and obstetric care received by the mother during pregnancy and lactation. It would be obvious that improvement of the health and nutritional status of the mother during pregnancy and providing safe delivery (by creating possibly a delivery booth in each village) by a trained midwife would go a long way in improving the obstetric outcome in terms of better birth weight, easy delivery and healthy infant.

Following line of action may be of value in bringing the IMR down to 70

1. Providing potable water and improving the sanitation in rural set up and urban slums.

2. Identifying high risk mothers and providing not only caloric supplement but also proper obstetric care.

3. Care of adolescent girls with respect to their nutritional status.

4. Effective implementation of national anemia prophylaxis programme to reduce both maternal and perinatal deaths due to anemia.

5. Creation of 'delivery booths' in villages manned with trained midwife.

6. To ensure prenatal immunization for T.T. in mothers and also complete immunization of infants.

7. Nutritional education not only to pregnant and lactating mothers but also to women in the community by using audio visual media.

8. Creation of incentives to community level health workers to educate women with respect to health care availability and proper utilization of the same. Awards can be provided for the health workers if they are able to reduce PMR and IMR in their areas.

9. Nutrition education with regard to weaning foods and infant rearing practices to the community.

If above steps are taken with sincerity and purpose, it will not only reduce the IMR level but also create a progeny capable of handling future health and nutritional problems in the community.

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Maternal And Infant Consequences Of Prenatal And Perinatal Infections

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As a part of this workshop I have been asked to summarize a broad area. The area is in considerable flux. Some of the consequences of maternal infections are very clear and their prevention is established. The implementation of preventive activities is more difficult. For other infections we understand the effects well enough, but we do not have a feasible prevention technique available. For a third category, we are not even sure of their effect, so that further basic study is necessary.

A. Vaccine preventable

1. Congenital rubella

The prevalence of rubella in pregnancy will vary with its epidemicity. For large established populations the disease will occur annually but for more isolated populations at longer intervals (often 6-9 years). Where vaccine has been used extensively it is a very rare disease.[1]

Congenital rubella syndrome occurs in 25% of infants born to women who acquire rubella in the first trimester of pregnancy. The risk falls to 10% by the 16th week and defects are rare when the neonatal infection occurs after the 20th week of gestation. Those fetuses infected early are at greatest risk of intrauterine death, spontaneous abortion or congenital malformation of major organ systems. Deafness, cataracts, microphthalmia, microcephaly, mental retardation, congenital heart defects, purpura, hepatomegaly, splenomegaly, radiolucent bone disease and meningoencephalitis, alone or in combination, are the principal outcomes.

These outcomes are preventable with vaccine use. There has been some debate about the strategy of vaccination.[2] The method used in the United Kingdom, which concentrated on preschool girls, has been shown to be less effective than the method used in the United States, which aimed for universal vaccination of all infants around 15 months of age. This has been very successful and congenital rubella is considered to be on the verge of elimination in the United States.[1] The U.K. strategy is undergoing revision, and will now include infant immunization. The U.S. strategy may add screening and vaccination in prepubertal girls to broaden the coverage of incompletely covered cohorts so that both will be similar. It is hoped that more countries will adopt a rubella vaccination strategy--usually in combination with measles vaccination--but it depends upon competing priorities.

2. Tetanus

In many developing countries, neonatal tetanus still represents about half of the neonatal deaths and about 25% of the infant mortality. Worldwide it is estimated that about 1 million newborn children contract tetanus each year and about 800,000 of them die.

By mechanism, tetanus is somewhat different as we know that the infant is exposed at birth, or soon thereafter, and there is no significant risk of fetal infection. The prevention is of two kinds. One assures a clean birth and handling of the umbilical cord, which is often the site of infection. The other is immunization of the mother in pregnancy, or prior to pregnancy, with tetanus toxoid. It is ironic that this eminently preventable disease is so resistant to control.

The first strategy is a prime target of the integrated primary health care systems of the world. Much attention has focussed on instruction of the traditional birth attendant in hygienic delivery and the issuance of midwife kits for severing, tying and dressing the cord. The second strategy consists of two doses of tetanus toxoid. Unfortunately, even with considerable effort, tetanus toxoid coverage of pregnant women in developing countries is often as low as 18%, reflecting lack of public and professional awareness of the problem.

Less than half the women in developing countries have one contact with maternal and child health services even once during pregnancy and less have two or more. The World Health Organization has changed their strategy to aim at recalling all women of reproductive age, using every encounter with the health system. Mass immunization of women of child bearing age is appropriate in some circumstances. In a recent study in Burma[3] it was found that the efficacy of two doses of tetanus toxoid in tetanus prevention was 92%, while that of hospital birth was 85%. Delivery at home by a trained attendant added an efficacy of only 33%. When efficacy and coverage were both considered, tetanus toxoid immunization was by far the most useful, contributing the major proportion (58%) of the mortality reduction. It is close to ideal as an immunizing agent being safe, efficacious, cheap and with few side effects. An agent that would give lasting immunity with one dose would be preferable, but control can be achieved with one dose of the current toxoid if it is given more widely. Hopefully, in less than one generation the breadth of coverage achieved in children, through the Extended Program for Immunization (EPI) of WHO, will begin to have its effects.

3. Hepatitis B

The prevalence of hepatitis B infections varies greatly. Those countries in the low group (N. America, Western Europe or Australia) have prevalence of 0.1 to 0.5%. The intermediate group (Eastern Europe, Russia, Mediterranean) have prevalences of 2-7% and the high group (China, Southeast Asia and Sub-Saharan Africa) have rates of 8-15%.

Overall, the risk of transmission to the mother is 20-30% (around 70% with Hepatitis B e antigen and 5% without.)[4] Without intervention, transmitted infection resulted in 13.7 chronic hepatitis cases per 1000 live births and 8.9 acute cases in a population with 10% prevalence. It is estimated that 50-60% of acute clinical hepatitis B cases can result from reactivation of carrier state and that carrier infants have a 25% lifetime risk of dying form infections or sequelae.

There is a growing number of countries who have now adopted plans for universal immunization of all neonates with 3 doses of HB vaccine, in the first year of life.[4] Such a strategy will be slow to show its effect, but marked reduction of sequelae can be anticipated including elimination of hepatocellular carcinoma. With price of vaccine down to US $0.85 per dose, containment is a reasonable public health strategy.

B. Bacterial or Parasitic Diseases

1. Malaria

Although malaria is caused by four species of Plasmodium, only P. falciparum has been implicated as causing placental infection, stillbirth, abortion, low birth weight and congenital malaria. The prevalence of infection in the mother varies from 0 to 75% depending upon epidemiologic factors. The prevalence in pregnant women will usually vary with the prevalence in school children in the same area. The transmission rate from mother to fetus or newborn is low (less than 5%) where the mother has demonstrated infection in the placenta. In epidemic communities, the incidence of congenital malaria is less than 2%. The net effect of malaria in pregnancy in areas of stable malaria is a two- to threefold increase in the proportion of low birth weight babies among primigravida women.[5] It is of interest that this is a maternal-neonatal infection where gravidity is important. Transmission from mother to infant appears to depend upon the density of placental infection at the time of birth. Congenitally acquired clinical malaria is rarely seen in areas of endemic malaria, but has been reported from areas of unstable malaria transmission, presumably because acquired immunity to malaria is not well established. Fetal loss is associated with severe clinical disease in the pregnant woman.

Regarding low birth weight, it is well established that babies born to women with P. falciparum placental infection are lighter, with a decrement in mean birth of approximately 150 grams in primigravida. This appears to be due to an increase in small for gestational age babies and not prematurity.

The intervention, which is being used widely but is currently being reevaluated, is prompt treatment of fever illness with an antimalarial drug and chemoprophylaxis throughout pregnancy. Chloroquine is the most commonly used drug but the low doses that are usually given for prophylaxis in pregnancy have limited effect on

reduction of parasitemia. Alternatives must be taken daily (e.g. biguanides) or are expensive (e.g. mefloquine). Recent or ongoing investigation in the Gambia, Burkina Faso and Malawi have produced variable results in the improvement of birthweight of babies born to mothers undergoing prophylaxis.

2. Syphilis

Maternal syphilis is a serious threat to the mother herself and inadequately or untreated may result in death or debility from cardiovascular or central nervous system complications. In addition, it may be disastrous in pregnancy. If infected, she has a one-third or less chance of having a normal infant (with early syphilis less than 20%). Overall she has about a 1 in 3 chance of having a normal child, a stillbirth or neonatal death, or a child with congenital syphilis (manifested at birth or, with late maternal infection, in the first of year). The clinical features of syphilis at birth are often not recognized as they are very similar to other forms of infantile sepsis. They include hepatosplenomegaly, jaundice, skin rash, rhinitis, anemia, and joint swellings. Hira has shown that altered patterns of mineralization or destruction of the metaphysical area are readily recognized on long bone X-rays and that their use with high risk infants or stillbirths is often overlooked. It is an efficient diagnostic method.[6] In a study in Zambia, syphilis accounted for 20% of spontaneous abortions, 40% of stillbirths and 30% of prenatal mortality.[7] One-sixth of new syphilis cases were acquired in pregnancy.

The prevalence of syphilis in pregnant women is low (0.03 to 0.3%) in countries such as those of Western Europe or North America. It is high (3% -22%) in countries such as sub-Saharan Africa, parts of South America and some island populations (e.g. Fiji). The transmission rate is 100% in early maternal syphilis and as low as 23% in late maternal syphilis (overall 40-70%).

The prevention should be simple. It is early antenatal care, serologic screening of all pregnant women and treatment of reactive women and their sexual partners with long acting penicillin. The screening test is inexpensive (RPR card US $0.20 per test) and the treatment is not expensive (US $1.00 per dose). However, the problems are not technical. There are problems of compliance. Antenatal attendance is the stumbling block in all countries, and in some, even if women attend, prenatal clinics do not often diagnose and treat syphilis. There is need for more intensive efforts in congenital syphilis prevention.

3. Gonorrhea

Maternal gonorrhea has been reduced to low prevalence in much of the world, but in all countries there are pockets of high prevalence. In general, in pregnant women in developed countries, the prevalence is 1% or less but is much higher (4-20%) in some developing countries (e.g. sub-Saharan Africa, Philippines, Thailand).

There are two areas of concern regarding maternal gonorrhea. The well understood area is transmission to an infant at birth, resulting in gonococcal ophthalmia neonatorum or, more rarely, in other septic complications, such as sepsis, arthritis or meningitis. The other effect is maternal choriamnionitis and premature delivery. Regarding gonococcal ophthalmia meonatorum (GON), the risk of transmission is 40-50%.[8] The group in Kenya, in a brilliant set of studies of the maternal and neonatal effects of gonococcal and chlamydial infections, has shown that the transmission rate of GON is increased by concurrent chlamydial infection. Untreated GON will lead to blindness, which, in turn, may lead to death in infancy.

The second maternal and fetal consequence of gonorrhea has been suggested by a series of retrospective studies, but has been much more firmly measured in a case control study in Kenya (Brusham RC, Unpublished observations). They found a threefold relative risk of gonorrhea in pregnant women with premature rather than full term deliveries. In that setting, gonorrhea accounted for 7% of the preterm births, if that association was deemed casual. The prevalence of maternal gonorrhea in that clinic was 6%. Interestingly, in another study by the same group, this association does not seem to hold, although the study has not yet been reported. (M. Laga Unpublished observations).

One more consequence of maternal gonorrhea to consider is maternal infertility. Gonorrhea infection at any time can result in future ectopic pregnancy or may result in infertility.[9] Post partum endometritis may follow delivery of a woman with gonococcal infection. Thus there are also maternal consequences of infection that warrant prevention.

Prevention of maternal and infant sequelae are best accomplished by diagnosis during pregnancy with prompt treatment of the mother and her sexual partner. Treatment of penicillin sensitive gonorrhea is simple--a penicillin drug accompanied by probenecid, usually in a single dose. When penicillin resistant gonococci are frequent (greater than 3% of gonococci in U.S. control guidelines)[10] alternate drugs are used. Spectinomycin or ceftriaxone are the most commonly used in the United States, but alternatives include other third generation cephalosporins, oxyquinolones or trimethoprim-sulfa drugs.

For prevention of GCON, neonatal ocular prophylaxis is effective in most instances. If a mother has acquired infection shortly before delivery, it is less reliable and a single dose of an appropriate antigonococcal agent is recommended for the infant. Ocular prophylaxis can be achieved with 1% silver nitrate drops, 1% tetracycline drops or ointment or 0.5% erythromycin ointment.[10] The antibiotic ointments carry an additional advantage of some level of prevention of chlamydial ophthalmia neonatorum. Ocular prophylaxis should be given as soon after delivery as possible--and always within one hour. In some developing countries, silver nitrate prophylaxis has become

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unpopular because of the frequency of chemical conjunctivitis due to evaporation an concentration of silver nitrate solution. Such side effects can be obviated by use of single dose ampules.

4. Chlamydial Infections

The maternal and neonatal consequences of chlamydial infections are quite analogous to gonorrheal infections, as is their prevention. There are differences regarding sequelae which alter the priorities for prevention. The prevalence of cervical infection with Chlamydia trachomatis ranges from 2-37% in various samples in the United States. Studies in developing countries fall into the same range. The rate of maternal-infant transmission of infection overall is 60-70%[11] (as measured by persisting antibody). For conjunctivitis, the rate of transmission is 15-50%, but for a degree of conjunctivitis that would be brought to medical attention it is 15-25%. For infant pneumonia, the transmission rate is 5-15% but only 5% would probably seek medical attention. Chlamydial ophthalmia neonatorum is usually a self limited disease. Untreated it may result in some conjunctival scarring and micropannus, but the blinding sequels associated with trachoma (its older relative) are not seen. This is probably because the repeated reinfection seen in the hyperendemic trachoma environment does not occur, nor are the environmental or bacterial co-factors of corneal damage occur present. Chlamydial conjunctivitis, by itself, is a source of considerable morbidity in some infants, which is reason enough for its prevention.

Chlamydial pneumonia of infancy is usually a benign disease.[12] The repetitive staccato cough and small airway blocking causes an obstructive pneumonitis of infancy (usually between 1 and 4 months of age) which can result in cyanotic spells. These are the usual reason for hospitalization, which rarely, if ever, has chlamydial pneumonia been a cause of death. Most chlamydial pneumonia is unrecognized or is an outpatient lower respiratory tract disease. There are now three studies [13-15] suggesting a lasting respiratory impairment following pneumonia in early infancy, which is another impetus for prevention.

Maternal effects are similar to those caused by gonococci. Chlamydia trachomatis infection can cause endometritis and salpingitis, which results in increased risk of ectopic pregnancy or infertility.[16] Both retrospective and prospective studies of chlamydial infection and infertility suggest that the contributions of chlamydial infection to these conditions may exceed of gonococcal infection, and may more often be silent.[9] In other words, fewer women with chlamydial obstructive salpingitis have a history of pelvic inflammatory disease.[17]

The role of Chlamydia trachomatis in adverse pregnancy outcome is less clear. There are at least five well designed prospective pregnancy studies that have shown a definite association of low birth weight or premature delivery with chlamydial cervical infection of the mother.[18-22] In three of these studies, such results have not held true for the total

study sample, but only for the subset of mothers who had evidence of Chlamydia trachomatis IgM antibody production during pregnancy, suggesting that they are a subset undergoing a primary infection or a more severe reinfection.[18,19,21] Whatever the interpretation, the attributable risk of low birth weight offspring is small--probably less than 4%.

The maternal, fetal and infant consequences of maternal infection warrant intervention. The optimal intervention takes place during pregnancy. Diagnostic tests for cervical infection remain expensive and demand a level of technology that is usually not universally available either in developed or developing countries. Chlamydial trachomatis is an obligate intracellular parasite and therefore requires cell culture, like viruses. Newer alternatives to culture are direct fluorescent antibody smears (necessitate high quality microscopes and trained observers) or enzyme immunoassay (necessitate expensive machinery but less technologic skill).[23] By whatever method, maternal screening and treatment of the pregnant woman and their partner with erythromycin and tetracycline respectively is the best preventive technique.[24] For prevention of possible fetal consequences, the earlier it is instituted the better. Neonatal ocular prophylaxis with tetracycline or erythromycin is somewhat effective, but failure to eradicate nasopharyngeal carriage permits some conjunctival reinfection to occur.[25] Neonatal ocular prophylaxis will also not prevent chlamydial pneumonia. The third strategy for both chlamydial and gonococcal infant disease is to use occurrence as an indicator of infected parents and to treat the trio. Such a strategy can be applied only in communities with low prevalence and where diseased can be assured of seeking medical care.

5. Mycoplasmal infection

The role of mycoplasma infections in adverse pregnancy outcome or in infant disease is more controversial than for either of the prior two infections discussed. Both Mycoplasma hominis and Ureaplasma urealyticum are very common organisms in the genital tract. Genital M. hominis ranges in prevalence from 60-90% (median around 70%). The risk factors for prevalence are very analogous to other sexually transmitted infections.

A number of prospective studies in pregnancy have implicated M. hominis in post partum endometritis and fever. One, in particular, implicated the organism independently from other potential genital pathogens.[18] The association of M. hominis and low birth weight is less clear.

U. urealyticum has been associated with chorioamnionitis which, in turn, is strongly linked to premature delivery. Two studies have shown an association of U. urealyticum and low birth weight, but such associations have not held up in larger studies, where other potential pathogens were concurrently studied.[26] The frequency of recovery of U. urealyticum from the surface of premature birth

placentae has been elevated over normal birth weight controls,[26] but there is little evidence that the association is casual. The first results from the large U.S. multicenter study of vaginal infections in pregnancy which is being conducted by the National Institutes of Health has not found an association of genital mycoplasma and low birth weight (Nugent R. unpublished observations).

The infant consequences are similarly not well established. Observational studies have suggested a role for M. hominis[27] in sepsis of infancy and U. urealyticum[28] in infant pneumonia, but the observations have not been confirmed.

6. Bacterial vaginosis

Bacterial vaginosis (previously termed non specific vaginitis) is now known to reflect a change in bacterial flora of the vagina. Hydroxide producing lactobacilli are replaced by a variety of organisms that are potential pathogens. Under unusual circumstances (that are yet to be defined) these organizations may ascend the reproductive tract and cause a chorioamnionitis. Such pathogens include Gardnerella vaginalis and anaerobes. It is hypothesized that this, in turn, may precipitate premature delivery. The condition is diagnosed from the character of the discharge, an elevated pH, an amine odor with KOH application, and the presence of "clue cells." An alternative diagnostic method is the interpretation of a cervical gram stain.[29]

The prevalence of bacterial vaginosis (BV) in pregnancy is 10-20%. Bacterial vaginosis was associated with premature labor and delivery in 3 separate studies.[20,22,30] These studies differ in methodology, definitions of prematurity, and ascertainment of BV diagnosis. Both Gardnerella vaginalis and genital mycoplasmas are more frequent in BV, and both have been associated with low birth weight and prematurity. The most recent study from that group fond BV to be associated with recovery of organisms from choroamnion, histologic chorioamnionitis and preterm delivery.[30] The mechanisms by which BV initiates preterm labor or premature rupture of membranes has been hypothesized to be the release of an enzyme that stimulates prostaglandin production with consequent initiation of uterine contractions. Treatment of BV is difficult in pregnancy. Clindamycin vaginal cream is now being evaluated (Hillier S, unpublished observations).

7. Group B Streptococcus

The prevalence of colonization of pregnant women with Group B streptococcus (usually both vaginal and rectal) varies from 10-25%. Sixty to seventy percent of positive women transmit the infection to the baby but only 1% of those infants become septic. The risk of early onset disease in the infant is increased by heavy colonization of the mother. Other risk factors are prolonged labor, preterm rupture of membranes, prematurity and fever at term.

This infant disease is rare but severe. Early onset disease usually results in sepsis and/or meningitis with untreated mortality greater than 80%. With optimal current therapy the mentality is still 15-25%. Late onset disease is often meningitis or bone and joint disease with a mortality of 10-20%.

There are no established interventions except for the prophylactic treatment of high risk infants with a penicillin and aminoglycoside combination. Other experimental preventive strategies are (1) intrapartum ampicillin treatment of mothers, designated as high risk by virtue of premature rupture of membranes, premature delivery or intrapartum fever[31], (2) oral penicillin treatment of babies with GBS in urine at 27-31 weeks of gestation[32] and, (3) administration of intravenous anti-GBS gamma globulin to infants of high risk mothers.[33] There is considerable research activity on vaccine against type III GBS (the type most often associated with late onset disease).[34] None of these interventions are currently recommended practice.

C. Viral infection

For human immunodeficiency virus (HIV), herpes simplex virus (HSV) and cytomegalovirus (CMV) the transmission rate for infected mother to offspring ranges to approximately 40%. They are also similar in that none of them are treatable. For each, there are antiviral agents with some activity--retrovir (AZT) for HIV, acyclovir or vidarabine for HSV and DHPG for CMV. In all instances the antiviral is suppressive. It is curative in none. Only acyclovir is not a highly toxic drug.

The prevalence of infection varies. HIV is hyperendemic in certain African countries and in some distinct population subsets elsewhere. It would appear that epidemicity is related to amplification by co-factors - male homosexuality, intravenous drug use (or blood or blood products) and genital ulcer disease. Of particular concern for vertical transmission are those factors that favor heterosexual spread. Genital ulcer disease appear to be one.[35] Genital ulcer diseases include chancroid, syphilis and herpes simplex disease. Vertically transmitted HIV occurs from 20-50% of infected mothers and would appear to be invariably fatal when symptoms arise.[36] The incidence of asymptomatic infection remains to be fully determined but is small.

The prevalence of HSV infection is variable and can be related to the prevalence in the pool and to sexual activity. When maternal-neonatal transmission occurs there is a marked difference related to the maternal infection status. The transmission rate is 30-50% with primary infection of the mother, but less than 5% for recurrent infection.[37] Unfortunately, the majority of transmission occurs in asymptomatic women and therefore the strategy of repetitive viral culture in the last trimester for women "at high risk" does not adequately predict transmission. The only strategy that is valid is culture of all women at the time of delivery with careful follow up and rapid treatment of symptomatic infants. There are no satisfactory methods available other than standard viral culture, which is not universally available even in developed countries. When infection is detected or when primary infection is recognized at term,

delivery by Caesarian section will reduce the chances of transmission. There is no inexpensive and simple prevention of HSV infection of infancy but, fortunately, primary infection with genital HSV (HSV-2) in the presence of high titers of HSV-1 (common place in developing countries), results in less apparent and less severe maternal disease and decreased risk of transmission to the infant. The relatively infrequent transmission of HSV from mother to infant has dire results. Eighty to eighty five percent have widespread organ involvement and seventy percent die. With early recognition and antiviral therapy there is considerable reduction but it does not eliminate mortality or sequelae.

Cytomegalovirus transmission from mother to infant is common.[38] This common virus is present in 1-20% of the cervices of pregnant women (higher in developing countries or in lower socioeconomic groups). The risk of true congenital infection is 0.5 to 2% of infected mothers. The great majority of such infants have no ill effect, but in some there is decreased hearing and some mental retardation. In contrast, CMV infection of infants acquired at birth has no apparent ill effect. It is very common (5-20% of all infants). Acquisition of CMV infection in early childhood is expected by the second year of age in most developing countries. The rare and most serious consequence of maternal infant infection is severe generalized cytomegalovirus disease of infancy (cytomegalic inclusion disease) of infancy--a disseminated fetal infection which occurs in a small percentage of primary maternal infections.[38] It may result in intrauterine death, premature delivery or severe congenital infection with multiorgan involvement. Antiviral treatment can be attempted but is not usually effective.

In all three viral infections, the current strategies are not effective and in all three, considerable research effort is being expended toward development of vaccines. In each instance vaccine preparation is difficult for different reasons. The optimal application of potential vaccines is also not clear--presumably they would best be applied to prepubertal children, particularly girls, but the effectiveness of such strategies will depend on the properties of the individual vaccines. For HIV and to some extent for HSV, the other preventive arm is behavioral-dependent upon recognition of infection state and aimed at prevention of transmission or prevention of pregnancy. The effectiveness of behavioral interventions remains to be determined.

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PRE- AND PERINATAL INFECTIONS AND INFANT MORTALITY

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Perinatal infections, especially neonatal bacterial sepsis and tetanus neonatorum, are an important cause of neonatal mortality in India. They are also an important cause of intrauterine death, prematurity and low birth weight babies. Early intrauterine infections during first trimester of pregnancy may lead to congenital malformations. Apart from the high incidence of neonatal mortality, intrauterine infections of the TORCH group and postnatal meningitis may lead to neuromotor disability during infancy and childhood.[1]

Mode of infection

The intrauterine infection may occur due to viruses, toxoplasma gondii and spirochetes. Rarely, infection may occur due to mycobacterium tuberculosis and malarial parasites. The fetal infection occurs either as a direct transplacental passage of infecting agent or following infection of the placenta. Ascending infection with contamination of liquor amnii and amnionitis may result in utero bacterial infection of the fetus.

Early intrauterine infections

Early intrauterine infections occur due to infection by TORCH group of organisms. Their exact incidence is not known in our country, but they do not appear to be an important cause of perinatal mortality.[1] Their incidence during pregnancy and risk of infection to the fetus is shown in table 1.

Table 1
Incidence of maternal and fetal infections

Microorganism	Mother (per 1000 pregnancies)	Fetus (per 1000 live births)
Cytomegalovirus	40-150	5-25
Rubella		
Epidemic	20-40	4-30
Interepidemic	1.0	0.5
Toxoplasma gondii	1.5-6.4	0.5-1.0
Herpes simplex	10-15	Rare
Treponema pallidum	0.2	0.1

Congenital malaria

Congenital malaria is estimated to occur in 0.3% of infants of immune mothers living in endemic areas (up to 10% in the non-immune mothers). Maternal malaria during pregnancy is associated with reduction in the birth

weight of the offspring by 150 to 300 gm especially among first born babies. Malaria during pregnancy may also lead to abortion, stillbirth, prematurity and intrauterine growth retardation.

Late intrauterine infections

Pregnant women are often exposed to a variety of infections especially in the developing countries, such as urinary tract infection, chronic dysentery, persistent salmonella infection, etc., adversely affecting the growth of fetus in utero. A number of microorganisms such as aerobes, anaerobes, chlamydia and mycoplasma are known to inhabit the cervico-vaginal tract. These organisms may cause involvement of fetal membranes and placenta by ascending transcervical infections. The spread of infection is facilitated by premature rupture of amniotic membranes, although there is evidence to suggest that even intact membranes can be invaded by the microorganisms to cause fetal infection. The rupture of membranes may actually be a consequence of infection rather than the cause of infection.[7] The genital tract infections are considered as an important cause of preterm labor by virtue of local release of prostaglandin.[5] The microorganisms are capable of producing phospholipase A2 enzyme from phospholipid components of fetal membranes and decidual cells. It has also been documented that bacterial lipopolysaccharide (endotoxin) and interleukin 1 (endogenous pyrogen) can induce amniotic epithelium to enhance the production of prostaglandin. Figure 1 summaries the pathogenesis and inter-relation ship between genital tract flora and occurrence of prematurity and low birth babies.

Figure 1
Pathogenesis of low birth weight babies due to perinatal infections

Cervico Vaginal Microflora

(Aerobes, Anaerobes, chlamydiae, mycoplasmas)

Trans-cervical spread

Intact membranes	Ruptured membranes

Intra-amniotic infection, chorioamnionitis

(Release of prostaglandin)

Preterm labor

Low birth weight babies

The genital mycoplasma namely Ureaplasma urealyticum and Mycoplasma hominis are common inhabitants of the maternal genital tract.[10] The colonization rate due to genital mycoplasma among pregnant women is estimated around 25%.[3,4] Naeye et al[6] demonstrated that in women with amnionitis, 40% of placentas were infected with Ureaplasma urealyticum. Klein and co-workers[3]

from Boston documented that isolation rates of mycoplasma from neonates were inversely proportional to the birth weight of babies. Braun et al documented that those pregnant women who harbored genital mycoplasma in their urine and cervices in the antenatal period delivered babies whose mean birth weight was 202 gm lower as compared to babies born to women who were not colonized. McCormick et al from Boston have demonstrated the therapeutic utility of erthromycin stearate to reduce the incidence of low birth weight babies and improve the birth weight of infants born to mothers treated with erythromycin stearate in a dose of 1 gm daily for a period of six weeks during the third trimester of pregnancy.

Studies from West have shown that 2-23% of pregnant women harbored chlamydia in their genital tract.[9] The ophthalmologists were the first to recognize that inclusion conjunctivitis due to chlamydia infection is more common in preterm infants. Thygeson[13] and Rees[9] documented 37% and 41% prematurity rate respectively in infants having chlamydia conjunctivitis. A large number of aerobic bacteria such as Group B streptococci, staphylococcus albus and aureas, listeria monocytogenese, E. coli, klebsiella species inhabit the maternal genital tract. Group B streptococcus (GBS) is a leading cause of early-onset neonatal infection manifesting as a life threatening respiratory distress syndrome due to congenital pneumonia in the West. However, GBS infections during perinatal period are rare in India.2 In our own experience early-onset neonatal septicemia due to intrauterine bacterial infection account for 40% cases of all neonatal septicemia. Most of these infections are caused by klebsiella pneumonia, E.coli and other gram-negative organisms.

Tetanus neonatorum accounts for 6.5% of all infant deaths in India. Every year nearly 230 to 280 thousands infants die within first month of life due to tetanus neonatorum in our country. Most cases of tetanus neonatorum are limited to deliveries conducted in the rural areas by untrained birth attendants or relatives.

Neonatal septicemia

Neonatal septicemia continues to be the leading cause of neonatal mortality in the hospital setting in our country.[12] The nasocomial infection most commonly occurs due to klebsiella, enterobacter, E. coli and staphylococcus aureus and albus. The infections are more common among preterm and low birth weight babies due to immunological immaturity and their greater exposure to a variety of potentially infected electronic equipments and procedures.[11]

Prevention of perinatal infections

Early intrauterine infection due to rubella can be prevented by providing rubella vaccination to all girls though TORCH group of infections are not an important cause of fetal wastage in our country. The administration of two doses of tetanus toxoid during pregnancy should be universalized throughout the country and all pregnant women should be provided with a sterile disposable delivery kit to reduce the incidence of neonatal tetanus. The infections during pregnancy such as malaria, urinary tract infections, tuberculosis, toxoplasmosis, venereal infections, etc., should be promptly recognized and effectively treated. The women with peripartal fever and premature rupture of membranes should be adequately treated with appropriate antibiotics. There is

a need to evaluate the therapeutic utility of erythromycin for treatment of genital infections due to mycoplasma and chlamydia in order to improve the maturity and birth weight of the offsprings. The mother should be educated to maintain proper hygiene of genital area. The vaginal examinations should be conducted with due caution and concern for asepsis. Proper housekeeping rituals in the neonatal special care units and feeding of low birth babies with human milk can go a long way in reducing the incidence of bacterial infections in the newborn babies.[8]

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Determinants of Perinatal and Neonatal Mortality and Strategies for Their Reduction in India

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The infant mortality rate has shown consistent decline from 127 to between 90 and 95 per 1000 births in the last decade. This fall has been largely due to a decline in post-neonatal mortality and there has been hardly any contribution by decrease in neonatal mortality.

The national health policy has set a goal to decrease the IMR to 60 by 2000 A.D. This would in actuality mean a fall of 30-35% in the next decade. It is the considered the opinion of many pediatricians and neonatologists that this decline in the mortality rate is unlikely to occur without a decline in the neonatal mortality rate.

The perinatal mortality rates have continued to remain between 30-80 in most of the states of the country. Only the states of Kerala, Jammu and Kashmir, and Goa have recorded a mortality rate of 30 or less. What has been worse and extremely discouraging are the trends between 1970-85 which have shown no decline in almost all the states.

A recently concluded national collaborative study on high risk pregnancies of the Indian Council of Medical Research has recorded the rural neonatal mortality as 58.4 and 54 for urban slums. Analysis of risk factors associated with mortality showed family income, living conditions such as number of rooms, sanitary conditions, education of mother, maternal weight < 40 Kgs, maternal height of < 145 cms, clinical anemia, UTI, abdominal girth of < 80 cms at term and uterine height < 30, previous fetal or neonatal death, birth interval of < 2 years, parity & place & person conducting delivery, with significant relative risks. (Table I)

TABLE I

Maternal Risk - PNMR, NMR

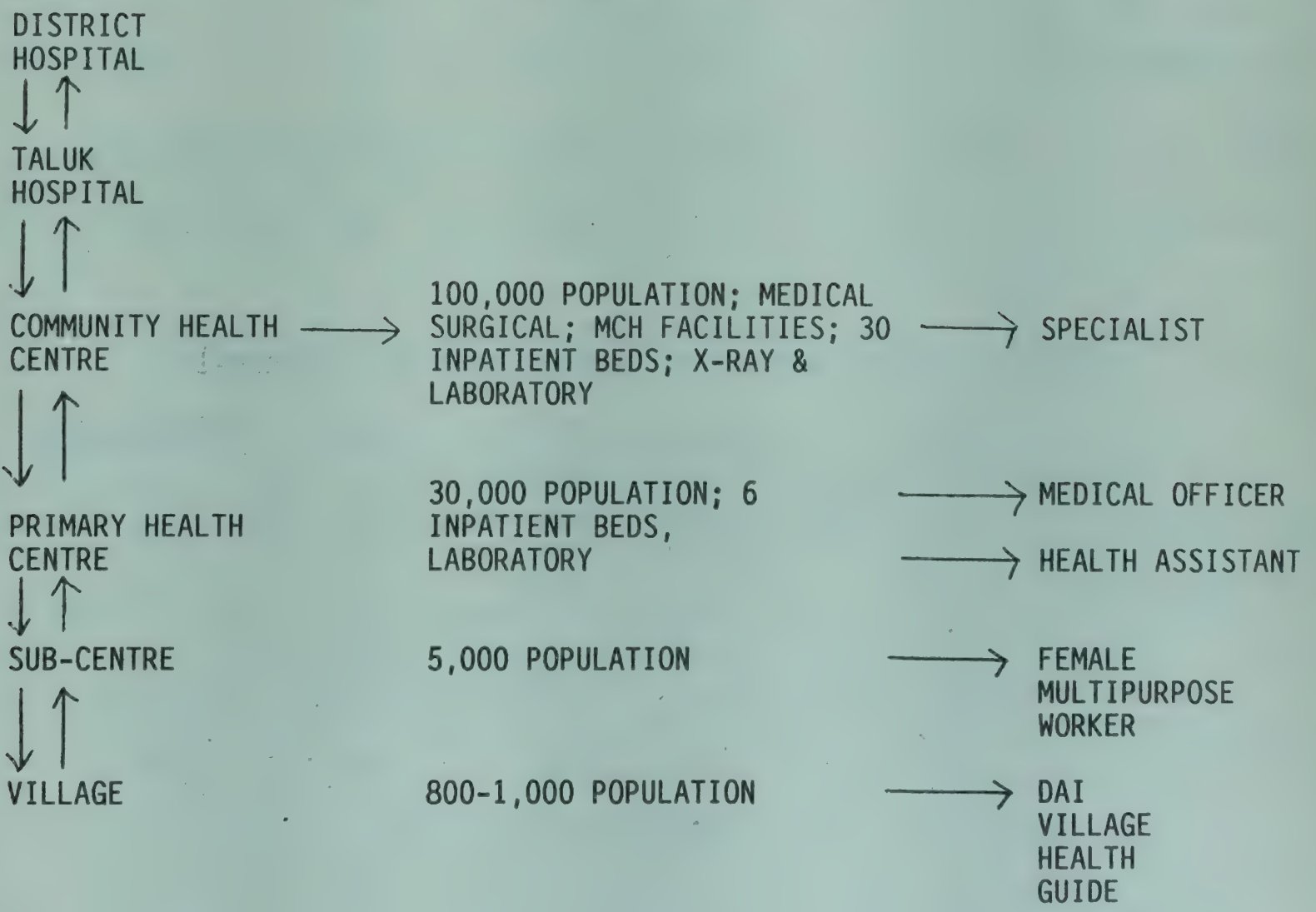
Maternal Risk Factors	Incidence (%)		% LBW		PNMR		NMR	
	U	R	U	R	U	R	U	R
1. Literacy (until Primary)	75.5	91.7	59.4	78.1	96.	102	69	61
2. Weight (< 40 kg)	32.0	31.0	40.0	47.7	-	-	-	-
3. Height (≤ 145 cm.)	18.5	13.0	37.5	44.9	32	71	35	63
4. ABD girth (≤ 80 cm of 36-38 wks)	27.2		30.0	-	-	-	-	-
5. Uterine height (≤ 30 cms at 36-38 wk)	46.5		37.8	-	-	-	-	-
6. Primipara	9.5	8.3	41.6	38.3	98	83	58	62
7. Previous abortions	13.6	6.1	30.6	35.0	60	86	27	84
8. Previous stillbirths	3.4	5.3	41.0	42.2	69	92	36	76
9. Birth interval (≤2 years)	42.0	28.5	33.1	31.1	42	54	31	57

Comparison of factors such as population below poverty line, female, literacy rate, nurses and professional birth attendant per 100,000 population, mean age at marriage and total fertility rate among different states and union territories of the country highlights the fact that the perinatal and neonatal mortality rates are not solely dependent on one of the enumerated factors, e.g., a comparison of Haryana and Kerala shows that whereas there are only 16% below poverty line in Haryana as compared to 27% in Kerala, the neonatal mortality is 55 and 21 respectively. Similarly there are only 15 trained birth attendants/100,000 in Haryana as against 53 in Tamil Nadu, yet the mortality rates are the same. One finds similar observations for female literacy, fertility rate, nurses, etc., in many states.

The delivery of health care in our country is affected in the rural area through subcentre, primary health centre, community health centres, which are believed to be supported by taluk and district hospitals. The health functionaries supposed to be provided include a village health guide, trained Dai, female multipurpose worker, health assistants, general medical officers in medicine, surgery, obstetrics, gynecology, pediatrics and anesthetists with a 30 bedded inpatient facility at community health centre. (Figure I)

FIGURE I

HEALTH CARE DELIVERY SYSTEM



The number of health units (subcentre, primary health centre and community health centres) trained dais, auxiliary nurse midwives, etc., have in the last seven Five-Year Plans risen from tens to hundred folds with facilities increasing from a thousand to over a hundred thousand and the outlay expenditure of family welfare programme from the first plan in 1951-56 of a few crores to over 500 crores. But these plans have made no impact whatsoever on the decrease of perinatal and neonatal mortality in last 30 years leading to a bitter and painful conclusion that the present maternal child health programmes are unlikely to affect a change in the present situation.

Indian Council of Medical Research surveys of over 100 PHC and subcentres have shown that the antenatal and intranatal care, the two key determinants of pregnancy outcome, lack even the basic facility such as a weighing scale, BP recorder, urine analysis, Hb estimation and delivery facilities in such centres, and even pregnancy registration is less than 40%. (Table II)

TABLE II

Antenatal care at PHC (from records of 100 cases)

	Hb.	B.P	URINE EXAM	WEIGHT	ROUTINE EXAM
No facilities	62	17	36	36	11
No information	81	119	101	100	98
Done	55 (27.8)	62 (31.3)	61 (30.8)	62 (31.3)	89 (44.9)
TOTAL PHC'S	198	198	198	198	198

Antenatal care at subcentre (from records of 100 cases)

	Hb.	B.P	URINE EXAM	WEIGHT	ROUTINE EXAM
No facilities	148	165	138	120	93
No information	28	19	35	51	59
Done	22 (11.1)	14 (7.1)	25 (12.6)	27 (13.6)	46 (23.3)
TOTAL PHC'S	198	198	198	198	198

( ) PERCENT PHC'S

Results of the ICMR national collaborative studies have also shown that less than 4% of the population considers ANM (Female multi-purpose worker) to

deliver MCH care. It further showed that while a Dai visits 25% of women and newborn postnatally, the Government health functionaries such as doctor, ANM etc., account for less than 10%. (Table III)

TABLE III

MCH Services - Expectations vs. Actual

	EXPECTATIONS (%)	ACTUAL (%)	
ANC Delivered by			
Doctor	65.7	46.3	
ANM	3.9	10.4	
DAI	24.3	42.4	
Place of ANC			
Home	38.7		
ANM's House	1.0		
PHC	51.1		
Not sure	9.2		
Place of Delivery		U	R
Home	50.0	8.6	58.6
DHC	5.9	0.8	6.9
Hospital	36.4	90.2	32.5
Others	7.7	0.5	1.9
Person Conducting Delivery			
Doctor	47.1	39.8	6.4
ANM/LHV/Nurse	2.4	28.1	5.8
DAI	37.7	5.3	34.2
Others	-	26.8	53.6
Overall MCH Facility Utilization		12.6	4.1

Home delivery by dais and relatives remains the way of child birth in the majority, even in urban areas. The knowledge on environmental temperature control at birth, hand washing, tying of cord, oropharyngeal suction, feeding, and recognition of high risk infant remains inadequate in health functionaries.

There is no health infrastructure in urban areas to deliver perinatal and neonatal care. It is largely based on maternal and child welfare centres, hospitals, etc., run by multiple Government agencies with no coordination. There is no referral system and links in urban and rural primary and secondary and tertiary level services.

The newborn remains a subject of total neglect by administrators, professionals, politicians and even by families who take the death of a neonate as God's wish. The neglect is glaringly visible with not even a single excellent satisfactory neonatal unit in the whole country with an 800 million population, 22 million births and 8 million low birth weight infants and over 1

million neonatal deaths annually and emergence of innumerable national programmes, including ICDS & UIP.

That the situation can be improved dramatically is reflected in the leading causes of neonatal deaths, such as birth injuries, aspiration syndrome, neonatal infections such as tetanus, pneumonia and diarrhoeas which contribute to over 50% of such deaths (Table IV).

TABLE IV

Percentage of deaths due to specific causes

CAUSES	1979	1980	1981	1982	1983	1984
Prematurity	31.4	33.5	36.2	37.3	43.6	45.3
Resp. Infection of Newborns	16.3	17.5	15.5	12.1	13.7	15.5
Malnutrition	13.9	11.3	11.7	10.3	1.8	-
Diarrhoea of Newborn	10.8	9.4	10.0	10.4	9.5	8.9
Convulsions	8.3	6.1	7.0	7.0	0.7	-
Other	20.1	22.3	19.6	22.9	30.7	30.3

SOURCE: RGI, Model Registration Scheme, Survey of cause of death (rural) - A Report Series 3, 1979 to 1984

Undoubtedly the single most underlying and contributory cause for neonatal deaths is the prevalence of low birth weight from 20-50% and preterm births of 7-14%. But a large proportion of low birth weights are over 1800 gm and preterm births are 36 weeks of gestation, which can be managed at home or at primary level with provision of essential physiologic needs such as warmth and feeding.

There are several studies demonstrating that maternal, perinatal, neonatal and child health services can be delivered successfully with reduction in mortality rates at an acceptable level. The features common to such studies are a continued commitment to the community, community participation in decision making and monitoring, health care based on felt needs of the community, a tiered system with linkages and referrals from domiciliary, village level to hospital, and most importantly a link health worker from the village itself irrespective of age, caste, sex and education but motivated and committed to the programmes. (Table V).

TABLE V

COMMUNITY BASED STUDIES

SUCCESSFUL DELIVERY OF MCH CARE

NAME	CHDP PACHOD	UPASI NILGIRIS	SEWA RURAL GUJRAT	AWARE ANDHRA PRADESH
Year started	1977	1971	1980	1975
Population covered	70,000	250,000	35.000	975,000
Organization health delivery	base hosp. health posts home del.	hospitals clinics home	hospitals mobile dispense village post	community health centre mobile clinics base hospital
health functionary	doctors,ANM PHN, nutri-tionist, MPWS, CHWS, trained dais	doctors, community link workers	CHVS, AWWS, TBAS, doctors MPW, ANMS	ANM, Dai, VHWS, doctors
link worker	CHWS	CLW	CHV	VHW
tiered referral system	yes	yes	yes	yes
Training	high priority	high priority	high priority	high priority
Community participation	active constant interaction	active constant interaction	active constant interaction	active constant interaction
Supervision				

PROGRAM INDICATORS

	% Cases							
	1978	1984	1971	1984	1980	1986	1979	1986
ANC	0	70	42	80	0	60.95	5	50
Referral	1.5	8	42	80	-	-	-	-
Delivery by trained dais	6	60	0	80*	25	85	3	30
Maternal mortality	12	2	-	-	-	-	-	-
N.M.R	96	45	-	-	-	-	-	-
I.M.R	120	70	119	48	164	61	110	65

* INSTITUTIONAL

OTHER PROJECTS: CINI-CALCUTTA, RUHSA-TAMILNADU
KEM-VADU PUNE, MINI HEALTH CENTRE-MADRAS

TABLE VI
Determinants of perinatal and neonatal mortality
and possible intervention

FACTORS		INTERVENTION
Static and high PNMR and NMR		Categorization by PNMR & NMR Rates
Determinants		
- economic	income, type of housing	Social interventions
- environmental	housing, water supply waste disposal, defecation facility	
- cultural	type of family, age at marriage, consummation of marriage	
- literacy	maternal education	
Maternal biological characteristics	age parity	community participation health education
Past obstetric history	spacing bad obstetric history -previous low birth weight -previous fetal/infant death	health education risk factors risk approach
Present pregnancy complications	anemia, bleeding, toxemia, UTI hypertension, etc. warm infestations premature labor	
Maternal nutrition	weight, height, midarm, skinfold anemia	
Personal habits	work, smoking, tobacco chewing alcohol consumption eating habits during pregnancy and lactation	risk factors risk approach
Perinatal care and delivery of care	antenatal visits -number -place -persons delivery -place -person hygiene -hand washing	reorganization of perinatal care flexibility
Neonatal factors	care at birth -resuscitation -warmth	neonatal care

	low birth weight -preterm -IUGR asphyxia respiratory problems -aspiration -pneumonia birth injuries pneumonias	
Community behavior	non-utilization of MCH services community perception of health worker	community participation in decision making
	community expectations	monitoring by community
Monitoring perinatal and neonatal	data collection indicators of perinatal and neonatal care	

LEAD DISCUSSION

P. K. MISRA

Poor availability and also utilization of MCH services in the peripheral areas are the important factors for high perinatal and infant mortality. Women's status, maternal health, obstetrical and postnatal care are interlinked with the mortality data.

In various studies on perinatal mortality rate, it has been shown that higher mortality is found in high risk pregnancies and high risk newborns. Thus the improved MCH care becomes the mainstay for improving child survival.

An action oriented programme for the community is needed in this regard. Some of the suggestions are as follows:

I. Improvement in the physical facilities at district hospital, community health center, primary health center and subcenters. They should be equipped according to recommendations already laid out.

They have been further detailed in the "Minimum Perinatal Care Recommendations of the Ministry of Health & Family Welfare, Government of India."

In the PHC and also in many district hospitals, the facilities for neonatal resuscitation and care are minimal or non-existent. All the medical colleges should be equipped at least with the facilities of level II and preferably for level III care of newborns as they form the highest referral centers. It is high time that we should also give thought to establishing a few regional perinatal care centers.

The population to be covered by PHC should be reduced so that the villages are not too far from these centers for access of the community. There is already a recommendation to this effect, but it needs to be implemented.

II. Concentrating mainly on the MCH care in the peripheral areas.

1. Training and orientation of paramedical workers, training dais and traditional birth attendants for MCH services with special reference to high risk approach. Early postpartum and postnatal visits are to be emphasized and high risk newborns should also be detailed.

2. Emphasis on registrations of pregnancies, especially early registration.

3. Involvement of the local voluntary workers and village head man for motivation of the community for better utilization of the existing MCH services.

4. Emphasizing better rapport between auxiliary nurse midwifes (ANM), lady health visitors (LHV) and anganwadi workers in ICDS areas. The importance of birth weight and taking it in practice also needs an emphasis.

5. Availability of delivering kits for the use of community and also encouraging their use.

6. Lady health visitor (LHV) to take a more active part in supervision of the work of ANM.

7. Composite MCH cards to be filled out for pregnant women and the details to be entered in the registers. An orientation of paramedical workers should also be given for recognizing the cause of death of neonates and infants. In case of doubt, the help of medical officers should be taken so that the data become accurate as far as possible and can be utilized for future planning.

8. Community education by paramedical workers (block extension educator BEE), medical officers, community health guide, etc., emphasizing MCH care and making them aware of the type of medical and health services available and their utilization. The check-up of the newborns, including their weighing and their care, also need to be emphasized.

9. Orientation of medical officers regarding package of MCH services, especially antenatal with high risk approach, intranatal and postnatal care with high risk approach and neonatal care.

10. Registration of marriages along with age should be introduced in the village register in which births and deaths are entered. This will help us in finding early marriages, especially of girls, and planning the preventive steps.

11. Pictorial dai pustika should be available with the dais for entering the pregnancies and deliveries and indicating high risk cases.

12. The assessment of paramedical workers should not be totally based on the FP work but also the sum total of MCH services should be taken into account. Birth and mortality data in children and mothers should be included. The coverage of their field area should be considered for FP activities and not the number of cases from anywhere. This will help in the better coverage of the field area regarding MCH as well as FP.

13. There is a need to develop audio-visual aids for community education and also training of paramedical staff. Teaching and training material should be developed and should also be available in abundance for use.

14. An integrated approach to the rural development for better transportation and access will help in improving the referral services. The referred cases should be given a special card and should get priority in the referral hospital. This should be widely publicized in the referral centers.

15. As mentioned earlier, perinatal and neonatal mortality medical factors are linked with socioeconomic, cultural and biological factors. It is also related to a general uplift of women's status. Early marriages are to be prevented and the existing law should be enforced in practice.

16. In the teaching and training programmes of undergraduates, including interns, pediatrics should be given due emphasis so that the MBBS graduates develop better skill and knowledge pertaining to perinatal, neonatal and child care, and MCH care. The Medical Council of India (MCI) should also be involved and apprised of the neonatal needs. Such training of undergraduates should be obligatory in all the teaching institutions of the country. The central and state government can also play an important role in implementation of such training and teaching programmes for undergraduates in consultation with the Medical Council of India.

Postneonatal Mortality

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Introduction

This paper examines the postneonatal mortality rates from selected developing countries and some interventions which have resulted in a fall in the rates.

The emphasis on working toward increased child survival, advocated by the WHO and UNICEF and supported by the governments of many developing countries, has helped focus attention on the relationship between specific interventions and their effect on child survival. While lower mortality rates and increased child survival is a good indication that the health of children has improved, the concern over the health and nutritional status of the children who remain alive is assuming an increasingly important position. Nutritional status can serve as a useful outcome measure, in addition to survival rates, in assessing the health of children.

Mortality Rates and Causes of Death

Mortality rates

In many developing countries a larger number of children die during the postneonatal period (1 through 11 months) than in the first month of life or during the early childhood years (1 through 4 years). The proportion of deaths in each of these age groups is dependent on how high the mortality rates are. Recent survey data from countries which have carried out Demographic and Health Surveys (DHS) illustrate this relationship (figure 1a) (Demographic and Health Surveys, First Country Reports 1986-1987). At very high levels of under five mortality (UNICEF classification of under five mortality levels: very high >170, high 95-170, middle 26-94, low = <25 deaths per 1000 live births), about 50 percent (range 40 to 65 percent) of the deaths among children under five years of age occur in the first year of life, compared with approximately 75 percent at middle levels of under five mortality (figure 1b). Equivalent relationships are seen in data compiled by UNICEF (UNICEF 1989). A similar pattern can be seen for the relationship between neonatal and postneonatal mortality rates (figure 2a). At the highest levels of infant mortality, approximately 75 percent of the deaths in the first year of life take place during the postneonatal period (figure 2b). In contrast only 55 percent of deaths occur during the postneonatal period when infant mortality rates are lower (below 70 per 1000 live births). The study of patterns of childhood mortality in Latin-America (Puffer and Serrano, 1973) is used to illustrate the relationship between neonatal and postneonatal mortality rates since the First Country Reports from the DHS surveys do not report these rates. Figure 3 shows the contribution of neonatal and postneonatal mortality at various levels of infant mortality based on data from India (Jain and Visaria 1988).

Fig 1a INFANT (1q0) AND CHILD (4q1)
MORTALITY RATES
From: The Demographic and Health Surveys

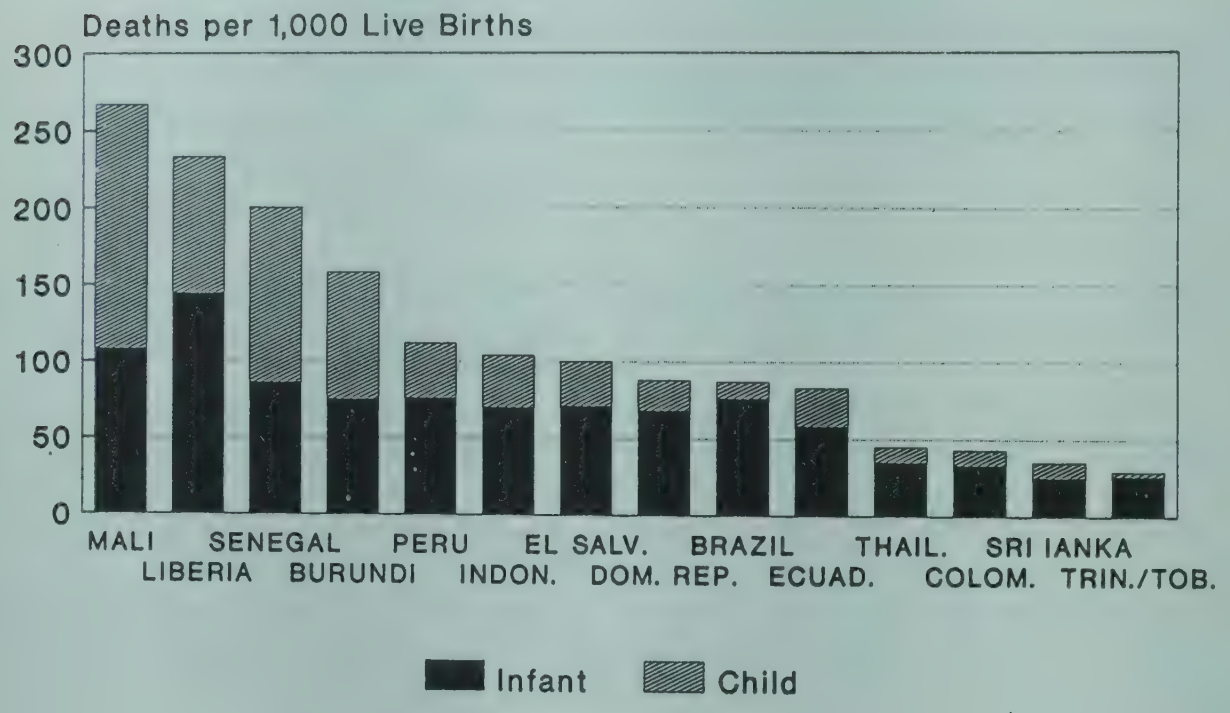
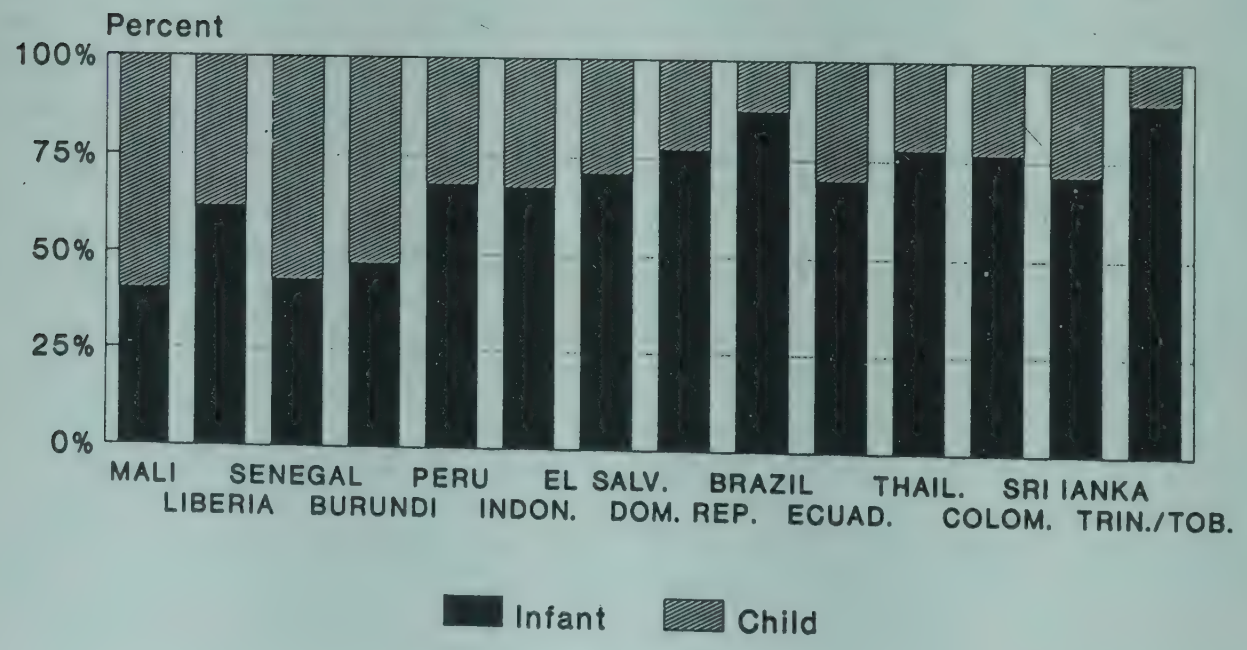


Fig 1b INFANT (1q0) AND CHILD (4q0)
MORTALITY
PERCENTAGE DISTRIBUTION



Rates for the 5 years preceeding survey

DHS 1986-87

Fig. 2a NEONATAL AND POSTNEONATAL MORTALITY RATES
From: Puffer and Serrano 1973

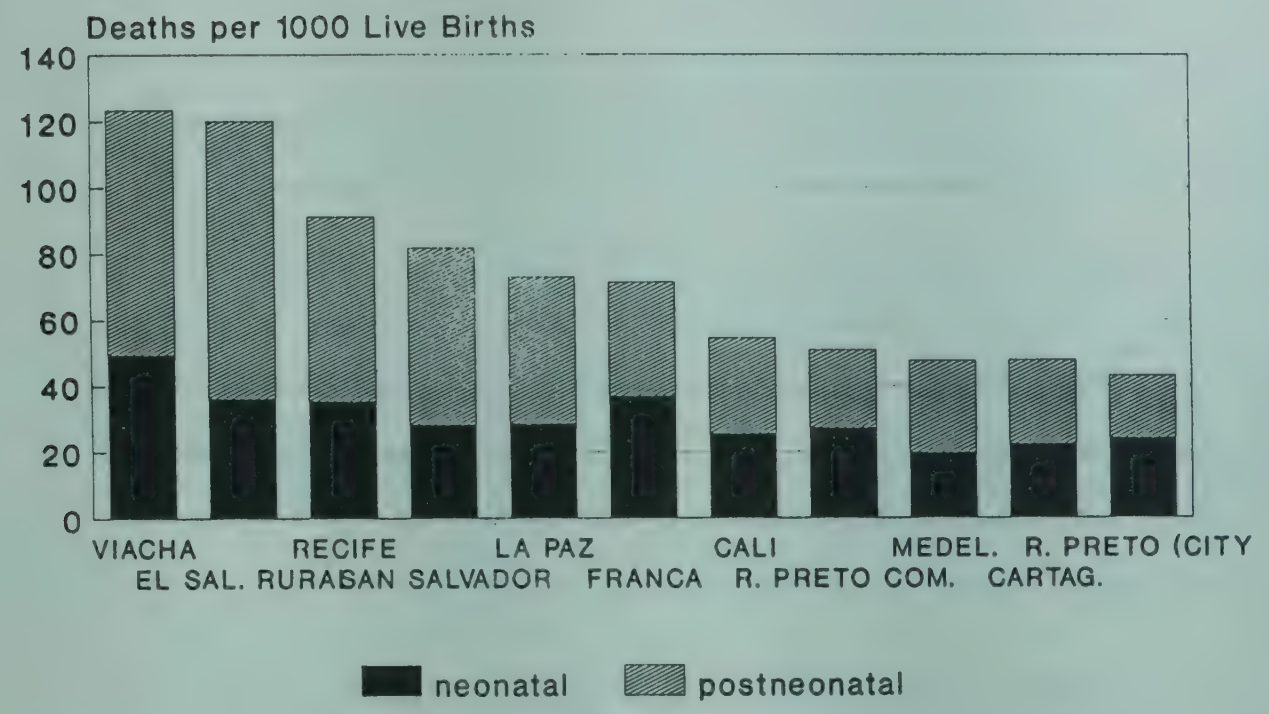
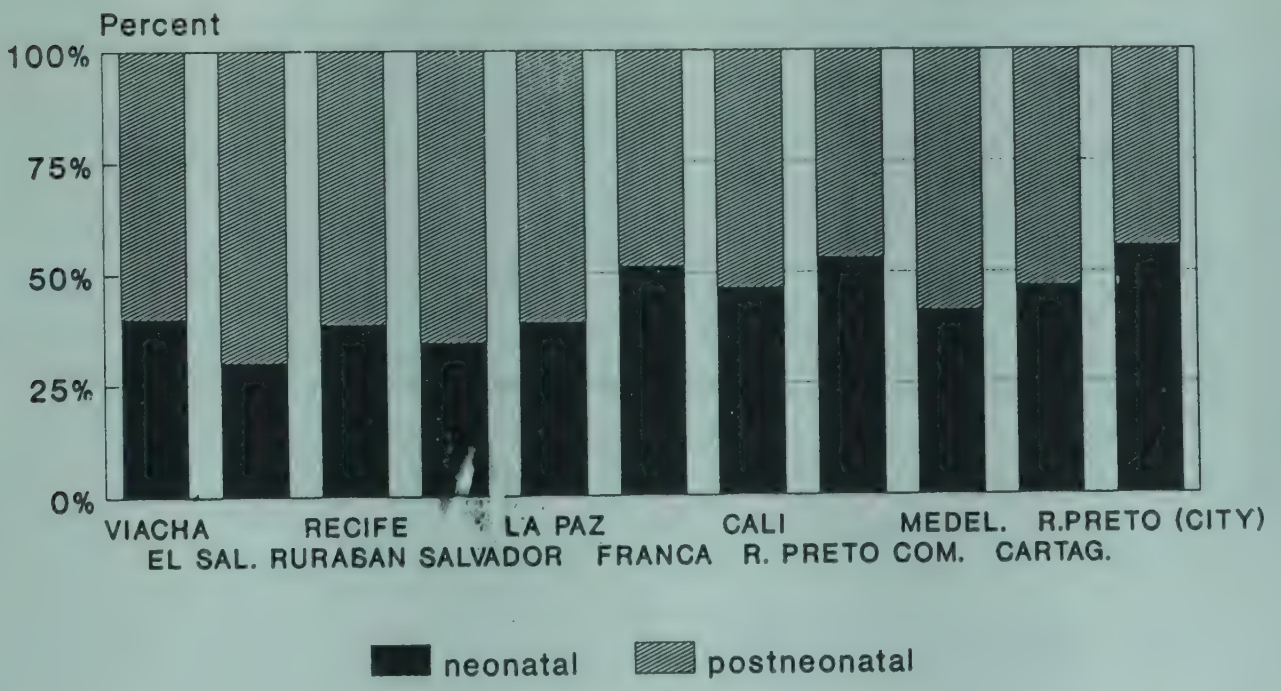


Fig. 2b NEONATAL AND POSTNEONATAL PERCENTAGE DISTRIBUTION



From Puffer and Serrano, 1973

Fig. 3a NEONATAL AND POSTNEONATAL MORTALITY RATES SELECTED STUDIES FROM INDIA

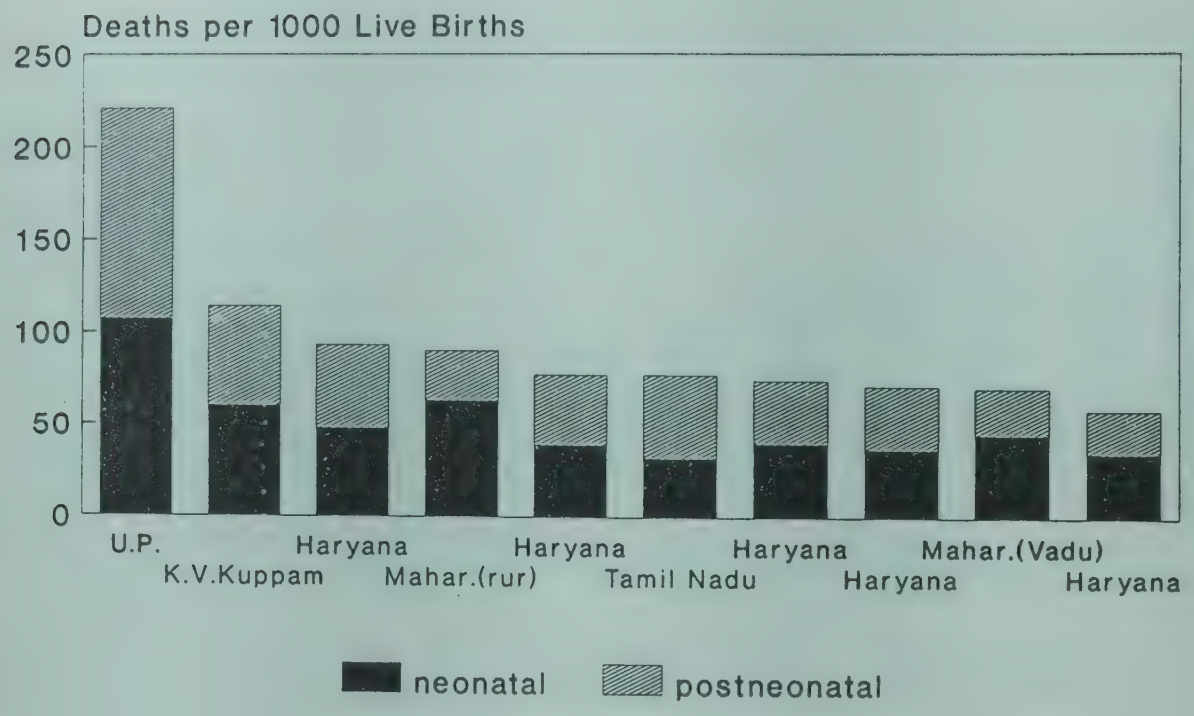
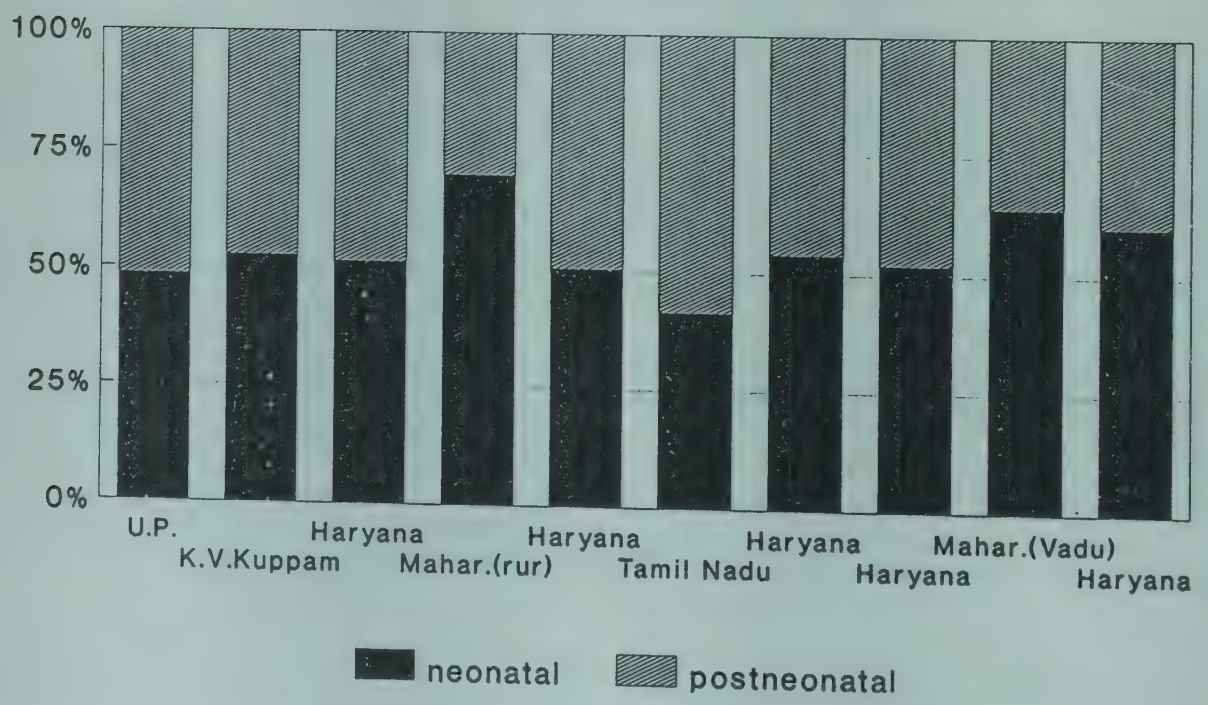


Fig. 3b NEONATAL AND POSTNEONATL PERCENTAGE DISTRIBUTION



From: Jain and Visaria, 1988

Summarizing these relationships, figure 4 compares the proportion of deaths taking place during the neonatal, postneonatal and childhood periods at high levels and middle levels of under five mortality respectively. Deaths which take place during the postneonatal period increase from about 30 to about 40 percent of all under five deaths. In contrast the proportion of deaths occurring in the childhood years (1 through 4 years) decrease from half to one quarter of all deaths. Deaths during the neonatal period increase from almost one fifth of all deaths to one third. In designing health services it is important to consider these differences in the distribution of deaths among children in various age groups depending on the level of mortality.

An examination of the mortality rates for these age groups reveals that for children aged 1 through 4 years the difference in mortality rates between areas with very high versus those with middle levels of under five mortality is approximately 85 deaths per 1000 live births (figure 1a). The corresponding difference in mortality rates during the postneonatal period is approximately 50 deaths per 1000 live births, and in the neonatal period 20 deaths per 1000 live births (figure 1a). These differences again illuminate the necessity for tailoring the health programs differently depending on the level of mortality. Specific interventions may result in varying decreases in mortality rates depending on the level of mortality.

Caution is required in less numerate societies, where children's ages are not always reported accurately, since there may be problems in using the infant and the postneonatal mortality rates. Significant age heaping on 12 months of age, will result in an underestimate of the infant and postneonatal mortality rates, while overstating the death rate among one through four year old children. Hence, in some situations under five (or under two) mortality rates may be preferable when describing the mortality patterns of less numerate populations.

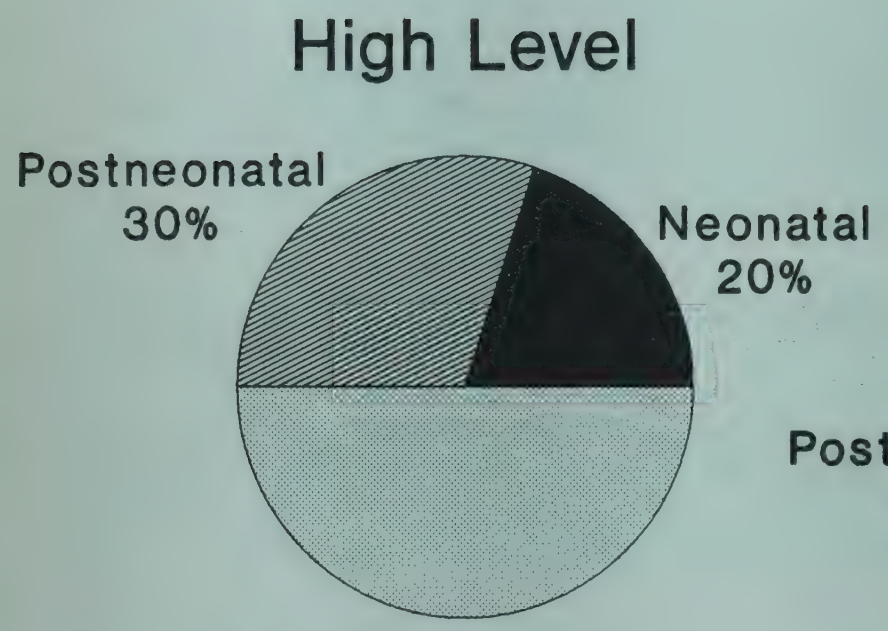
Causes of death

The causes of postneonatal death are similar to the causes of death in children aged 1 through 4 years. However, in most countries, there are more deaths per month of age in the postneonatal period than during each month in the subsequent four years, this higher mortality rate among children aged 1 through 11 months may reflect 1) higher incidence rates of the diseases, 2) higher case fatality rates, or 3) that those children at highest risk of dying have already died during the first year of life.

Figure 5 illustrates the most common causes of death in the postneonatal period, according to the findings of the 1973 study from 15 Latin-American countries (Puffer and Serrano, 1973). In most of these countries diarrhea was the cause of 45 to 70 percent of the deaths (Viacha and La Paz in Bolivia, with very high proportions of deaths attributed to respiratory tract disease, were the only exception, with only 25 to 30 percent of the deaths attributed to diarrhea). Respiratory tract disease was listed as the cause of 15 to 20 percent of the deaths (except in Bolivia where 45 to 50 percent of the deaths were caused by respiratory tract disease). Measles accounted for between 5 and 17 percent of the deaths.

Fewer deaths are caused by diarrhea when postneonatal mortality levels are lower (figure 5). Mortality rates for respiratory tract disease vary less. It

Fig. 4 Summary of Proportion of Deaths in Each Age Group at Different Levels of Under 5 Mortality:



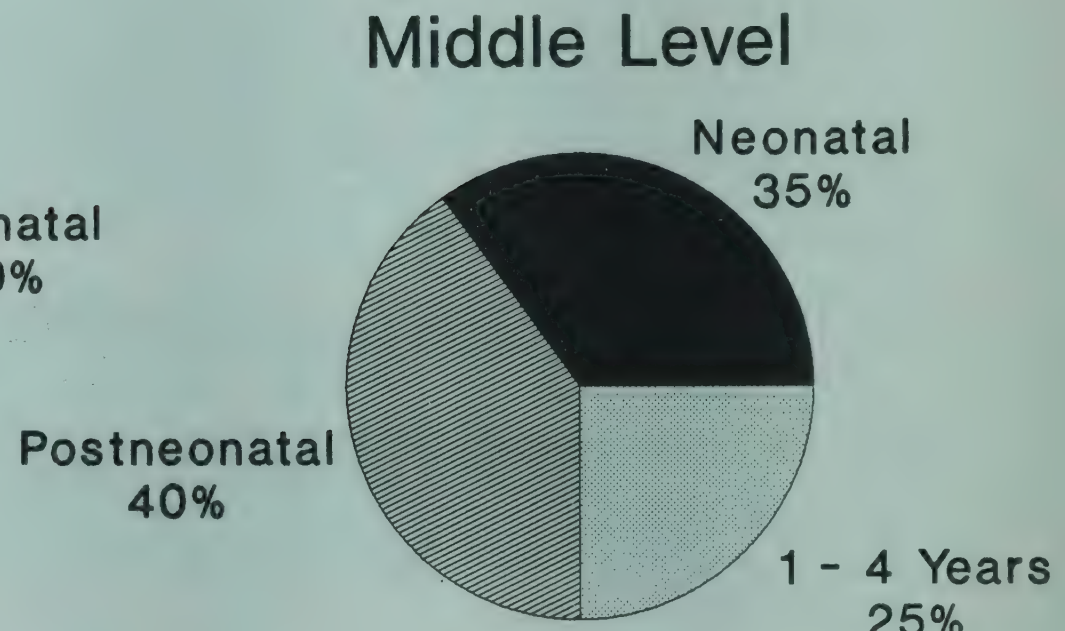


Fig. 5a CAUSES OF POSTNEONATAL DEATHS From: The Study of Patterns of Childhood Mortality - Puffer and Serrano 1973

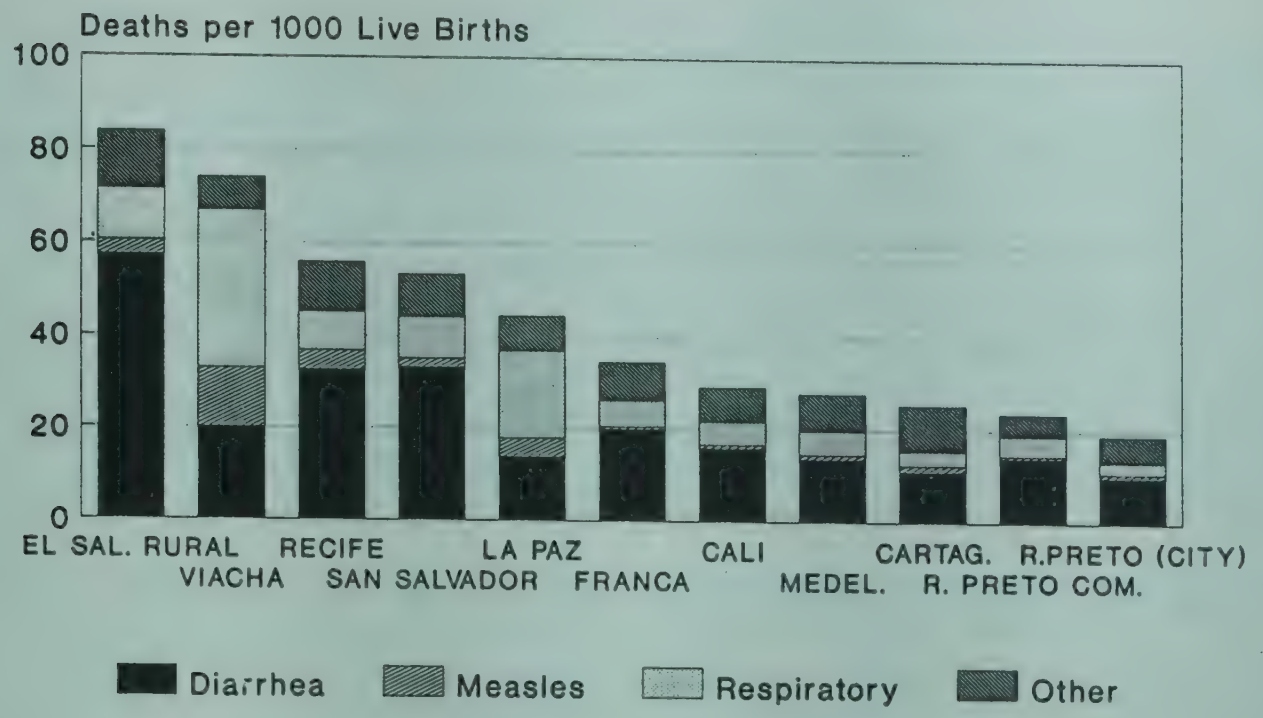
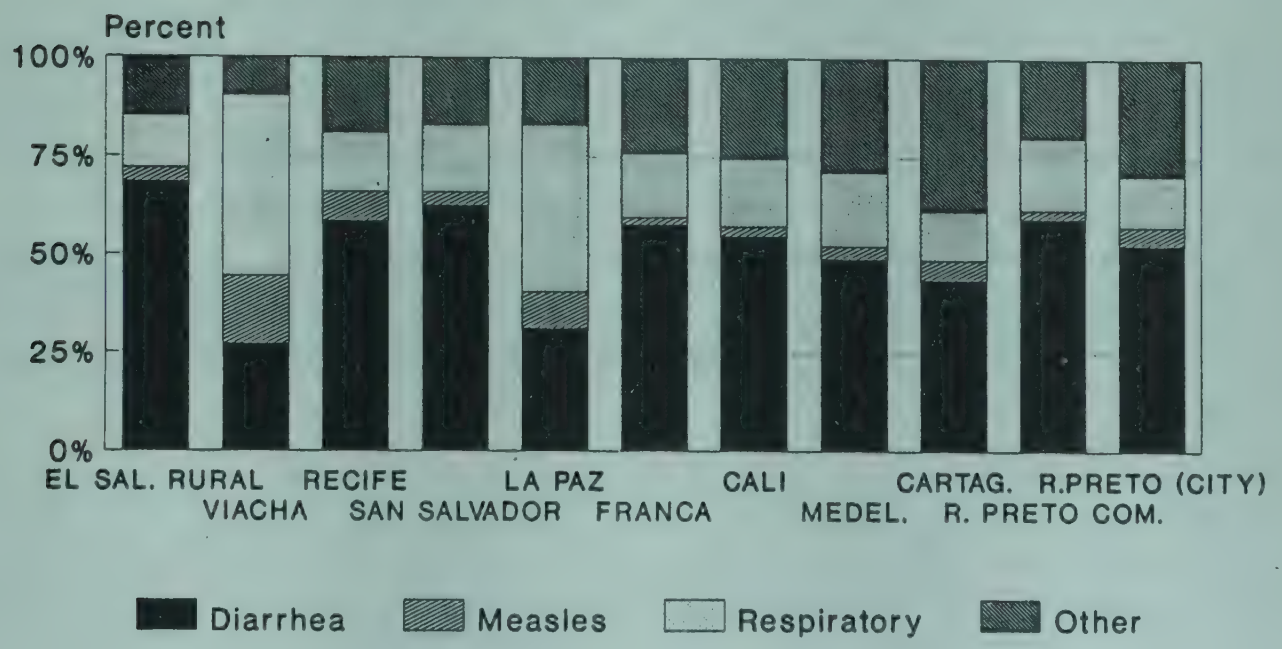


Fig.5b CAUSES OF DEATH PERCENTAGE DISTRIBUTION



From Puffer and Serrano, 1973

is of interest that measles specific mortality rates are low at lower levels of postneonatal mortality. In addition, at higher levels of postneonatal mortality, some of the respiratory and diarrhea deaths are likely to represent post-measles mortality.

Three conditions (diarrhea, respiratory tract infections and measles) are identified as the cause of 2/3 to 3/4 of the deaths in the postneonatal period. However, other preexisting conditions, which allow these illnesses to result in a fatal outcome, are also important as we work toward improved child health and increased child survival. Examples of such preexisting conditions include measles, malnutrition, low birth weight, malaria, possibly Vitamin-A deficiency, and in some populations AIDS. Deaths caused by post-measles pneumonia or post-measles diarrhea are often not classified as measles deaths; however, it has been shown that mortality rates remain high for several months following measles illness, and that the most common cause of these post measles deaths are diarrhea and pneumonia (EPI 1987). Other studies have demonstrated that effective malaria control programs and treatment of malaria result in mortality decreases from a number of causes (Greenwood 1988).

Health Programs and Specific Interventions

Health programs

The book "Good Health at Low Cost" describes the marked declines in infant and childhood mortality which have occurred in three countries and in the State of Kerala (Halstead 1985). In Costa Rica the infant mortality rate fell from over 60 to 20 deaths per 1000 live births over a ten year period starting in the early 1970's. The postneonatal mortality rate decreased from 36 to 8 deaths per 1000 live births, and the neonatal mortality rate changed from 24 to 11. In comparison, between 1950 and 1975, the infant mortality rate had fallen from 100 to about 60 per 1000 live births, changes in postneonatal mortality accounting for almost all of the decrease. Decreases were demonstrated for most diseases, except those related to congenital factors or to pregnancy and delivery. The greatest decrease was seen for diarrhea specific death rates, with a more modest decline for respiratory deaths. These changes occurred in the context of economic and social improvement, however, careful statistical analysis of all the factors which influenced this fall in mortality rate identified health interventions as the main determinant of the fall in infant mortality. The health care interventions included general preventive services and specific programs such as vaccination campaigns. A marked drop in fertility rates was felt to account for a 25 percent reduction in the infant mortality rate.

Sri Lanka (34 deaths per 1000 live births in 1980) and the state of Kerala (39 deaths per 1000 live births in 1981) are also mentioned as examples of areas with low infant mortality rates, although the mortality declines took place over a much longer period of time than in Costa Rica. The factors which Costa Rica, Kerala and Sri Lanka have in common, have been described as the "social and political will" to provide basic health services to the whole population. Although many challenges exist for a large country like India with its regional diversity, it is encouraging to note that health interventions targeted to provide preventive and primary health care services can result in marked declines in mortality rates as described for Costa Rica.

Interventions

The following interventions are important components of most programs aimed at increasing child survival and improving child health.

Prevention of deaths from vaccine preventable diseases

Most immunization programs include vaccines against measles, tuberculosis, diphtheria, tetanus, pertussis, poliomyelitis, and sometimes typhoid fever. Considering data on age specific incidence and case fatality rates, measles vaccine prevents the largest number of deaths. Studies have shown marked reductions in mortality rates following effective measles vaccine coverage in a community. In addition to declines in measles specific mortality rates, reductions in the deaths attributed to acute lower respiratory tract infection and diarrhea have also been observed (EPI 1987). If new strains of measles vaccine currently being tested are found to be efficacious, measles vaccine can be given at an earlier age preventing measles deaths in the younger infants, among whom the case fatality rate is highest (Whittle 1984, Aaby 1984).

In areas where neonatal tetanus is common, maternal vaccination against tetanus will have an impact on mortality rates (Stanfield 1984). Vaccination programs also include immunization against whooping cough, which also contributes to a significant number of deaths (EPI 1988). The development of the new acellular pertussis vaccine is likely to result in a vaccine of greater efficacy and with fewer side effects than the vaccine currently in use.

Prevention of deaths from diarrhea

Oral rehydration therapy (ORT) of watery diarrhea with a solution prepared either from a packet containing electrolytes and a carbohydrate (ORS) or from ingredients available in the home, prevents deaths caused by dehydration (Egypt 1988) and reduces the number of children requiring hospitalization for rehydration therapy (Weekly Epid. Record 1988). The effectiveness of ORT programs is dependent on ongoing education regarding the indications and use of the rehydration solutions. If the program advocates the use of ORS packets rather than solutions made from ingredients available in the home, an efficient system for the distribution of the packets is a necessity.

In addition to the use of ORT to prevent and treat dehydration, the effectiveness of diarrhea control programs is improved if they also succeed in teaching mothers the importance of continued feeding during and after the diarrheal illness.

Prevention of deaths from acute lower respiratory tract infection (ARI)

As already mentioned, measles vaccine prevents post-measles pneumonia (EPI 1987) and pertussis vaccine prevents deaths due to whooping cough. Vaccines against *S. pneumoniae* and *H. influenza* have a potential for reducing deaths from acute lower respiratory tract infections (or pneumonia) (Berman 1985, Shann 1984). While these vaccines are immunogenic in even young children, field trials are needed to demonstrate the impact of these vaccines.

In addition, early diagnosis and antibiotic therapy prevents pneumonia deaths (ARI 1987, Datta 1987). The WHO has developed an algorithm to serve as an aide

in the training of village level health workers in the early diagnosis and treatment of acute lower respiratory tract infection (pneumonia). Implementation of ARI treatment programs as recommended by the WHO will need the development and maintenance of good lines of communication between the community level primary care workers and health personnel in the hospitals and clinics. Children who do not improve despite the initiation of appropriate antibiotic therapy will require referral to a health center or hospital. "Back referrals" from treatment facilities will require follow-up at the community level.

Nutrition and growth monitoring

Malnourished children are at greater risk of dying than children of normal nutritional status (Chen 1980, Kasengo Project Team 1983). Though the immediate cause of death may be respiratory infection or diarrhea, malnutrition may be the reason why the illness terminated in death. As is well recognized, the malnutrition itself may have resulted from an illness such as diarrhea, measles or tuberculosis. Nutritional status is, of course, also influenced by food availability and feeding practices, which are in turn related to socioeconomic status. Hence the nutritional status of a population of children will reflect past health status as well as socioeconomic and cultural factors. Both the occurrence of illness and their medical management will determine their impact on the child's nutritional status.

Some populations that have low mortality rates may still have high levels of malnutrition. An example would be Sri Lanka where 28 percent of preschool children are classified as stunted (height-for-age less than -2 S.D. below the WHO/CC/NCHS reference population median) and 13 percent of children are wasted (weight-for-height less than -2 S.D. below the WHO/CC/NCHS reference population median)(Demographic and Health Surveys First Country Reports 1986-1987). The conditions which are common causes of death, e.g. diarrhea, respiratory tract infection and measles, also place the child at risk for becoming malnourished. Hence the nutritional status of a child who <u>survives</u> one of these illnesses may deteriorate. Improvements in medical care initially result in improved child survival and in a lowering of mortality rates while the proportion of children who are malnourished may remain unchanged, as more children survive potentially fatal illnesses. Since nutritional status is influenced by factors other than the occurrence and management of illnesses, improvements in the nutritional status of a population of children may lag behind declines in mortality rates.

Breastfeeding without supplementation is recommended for young infants, with the introduction of appropriate weaning foods around the age of three to six months. In the first months of life the establishment of full breastfeeding without the interference of breastmilk substitutes is important. Subsequently the introduction of weaning foods, or "beikost," is necessary to provide sufficient calories for the growing child.

Growth monitoring helps to identify children who are not growing normally, aiding health personnel in deciding when further investigation is indicated, and giving them a tool to evaluate the child's progress following an intervention. Weight, plotted against the child's age, is most commonly used in longitudinal growth monitoring of individual children.

Periodic cross sectional surveys of anthropometric measurements serve to assess changes in the overall health and nutritional status of a population of children over time. Cross sectional surveys are also useful in comparing the nutritional status of different populations. When assessing populations of children, the most useful anthropometric indices are height-for-age and weight-for-height. The WHO recommends that all anthropometric status surveys use the same reference population (the WHO/CC/NCHS reference population) in order to facilitate comparison between different populations of children, and to be able to document changes over time in a given area. Periodic nutritional status surveys in an area, serves as the growth chart, the Road-to-Health chart for that population, documenting changes over time.

Since Vitamin A deficiency is common and has been linked to malnutrition and increased mortality levels in addition to causing blindness, many health programs include period Vitamin A supplementation (Sommer 1986).

Malaria control programs

In populations endemic for malaria, reductions in transmission rates through vector control or community based treatment have resulted in decreases in early childhood deaths (Greenwood 1988, Graves 1987). As is the case for mortality changes following widespread measles vaccination, deaths due to causes other than malaria also exhibited marked declines.

Antenatal care

Providing antenatal care to the mother can result in the prevention of a substantial number of perinatal deaths, and may avert deaths in the subsequent months of life. Identification and appropriate management of high risk pregnancies is likely to have the greatest impact on deaths in the perinatal period, but there may also be a reduction in postneonatal deaths, especially from causes related to low birth weight. Antenatal visits also offer an opportunity to teach mothers about breastfeeding, which may become more important as urbanization increases and traditional sources of social support may not be available to the mother.

Family Planning

Decreased fertility rates are correlated with lower infant and child mortality rates, and short birth intervals have been shown to place infants at higher risk of dying (Rutstein 1986) and of being malnourished (Sommerfelt 1989), hence continued emphasis on family planning programs is important. On the other hand, the lowering of infant and childhood mortality rates is likely to have a bearing on fertility preferences, resulting in greater demands for planning services.

Issues of importance in India

Strategies to reduce postneonatal mortality

Various definitions of primary care exist. Primary care has been defined as "first contact medicine," while the primary care provider has been viewed as the person who serves as the contact point between the health system and those it serves. In some situations the primary care provider is a village health

worker, while in other settings a pediatrician or nurse practitioner serves in this role. Primary health care also implies that preventive health services are provided to the whole population.

The services rendered through the primary health care system must address the most significant causes of mortality and morbidity in addition to being responsive to the needs expressed by the community being served. For example, in most areas in India effective ORT programs will reduce the number of deaths resulting from watery diarrhea, hence ORT programs are a high priority for the primary health care system and for the primary health care providers. Car accidents are a common cause of death in young children in the U.S., hence the promotion of car safety seats for infants is a high priority in the delivery of primary pediatric care. However, the treatment of diarrhea to prevent dehydration and death remains an ongoing task for primary care providers in the U.S. as well.

Shift in the focus of the health services as mortality declines

A distinction has been made between comprehensive primary care and selective primary care to highlight the need to set priorities in the face of scarce resources (Walsh 1979). While it is necessary to set priorities, it is also important to anticipate how these priorities will change, in order to be able to focus the health resources on interventions which have been shown to be effective. As mortality rates decline, and as the causes of death change, new priority diseases will need to be brought into focus by the health services, while maintaining the momentum in the areas which helped reduce the mortality rates in the first place. An example would be the need to maintain ORT programs following a fall in deaths caused by dehydrating diarrhea, while allocating more resources to care for other conditions, e.g. conditions which are treatable if detected early (e.g., septicemia or meningitis). The need for continued input into ORT programs will be determined by the prevalence of diarrhea and the presence of conditions which encourage the spread of diarrheal disease.

Since mortality is also affected by factors other than health services, it is of importance to anticipate how these may change in the future, concomitant with anticipated changes in mortality rates. A decrease in breastfeeding, for example, could lead to an increased risk of dying, both directly by resulting in malnutrition, and indirectly through shorter birth intervals if the mother is not using effective family planning methods.

Expectation and demand for services

It has been pointed out by several observers that a hallmark of the countries that have succeeded in lowering mortality rates and improving the health of children, is that the community has seen health care as important. Another common factor has been that the levels of education, in particular among women, is quite high, and that income distribution is judged to be more equitable than in other countries. Several programs carried out at the village or block level in India have the potential for helping to create this expectation or demand for health services. The primary health center (PHC) system, with one health center planned for every 50-100,000 population in rural areas, implies the idea that everyone is entitled to access to health services. The family planning programs also reflect the importance of access to health

services, both because the family planning services are delivered through the health care system, and also because acceptors of permanent methods of family planning expect that their children will survive.

The mandate of the Anganwadi worker of the ICDS program includes growth monitoring, nutrition education, and serving as a link with the PHC system. The workers at the village level are potentially of prime importance in bringing about the crystallization of an increased awareness and demand for health services.

Linkages between the various levels in the health system

The effectiveness of primary care services depend not only on how well the high priority programs function, e.g., immunization, family planning and ORT programs, but also on whether these are linked to the secondary and tertiary care tiers of the health care system. Examples of the necessity for this are children with pneumonia who do not improve after treatment, or women with complicated obstetrical problems, requiring hospital care. These linkages will probably prove of increasing importance as mortality rates, and fertility rates fall, and as parents depend on assistance from the health system to assure the survival of their children.

Missed opportunities

The use of missed opportunities would include the immunization of children who accompany the mother when she goes for an antenatal visit, and conversely, arrange for an antenatal check up for the pregnant woman who brings her child for an immunization. Other examples of missed opportunities are children who visit a clinic or health center with a minor illness, and who could get immunized at that time. Malnourished children identified during vaccination campaigns should be investigated and treated.

Collaboration with non-governmental agencies

India has an extensive system of primary health care centers and their subcenters, talukk hospitals, and district hospitals. There are many examples where this governmental health system collaborates with voluntary non-governmental agencies in providing health care. This collaboration may involve all primary health services for a given geographic area, or may concentrate on the delivery of specific services, e.g., a leprosy control program. As the states of India move toward reducing infant and child mortality rates and improving child health and nutrition, collaboration between governmental health services and non-governmental agencies may prove to be of value.

High risk groups

The importance of reaching out to high risk groups is already recognized in India; the ICDS program has been specifically designed to reach some of them. As mortality rates decline, it will become increasingly necessary to extend the health services to such high risk groups in order to sustain the mortality decline. Groups at especially high risk are populations in disadvantaged rural regions and city slum dwellers.

Education and literacy

Education, especially of women, has often been shown to bear a close relationship to infant and childhood mortality rates (Caldwell 1986). This can in part be explained by other socioeconomic factors which are associated with education. But studies have shown that education, especially of the mother, exerts an independent effect on the mortality levels. It is difficult to envision significant declines in mortality rates without increasing literacy among women.

Medical education

Medical education serves a key role in determining the quality of health services offered to the population. If medical education continues with primarily a clinical orientation, it will be more difficult to provide health services that address both the needs of the individual and of the community as a whole. In India it is already recognized that medical education is important; interns must spend three months of their internship in Departments of Social and Preventive Medicine or Community Health. A certain amount of time is set aside for epidemiology, community health, statistics and public health in the medical school curricula. However, often these subjects are taught exclusively in a classroom setting, without any practical experience; the medical students do not learn the joys and challenges of the subjects of epidemiology and community health. They may also not encounter a role model who inspires them to pursue work in these fields after their studies are completed.

No one disputes the value of students examining patients when learning about auscultation of the heart in order to learn to recognize heart sounds and heart murmurs. Similarly, practical experience in doing simple surveys and projects in the community are essential in order for the physician to understand the underlying principles and basic concepts of primary care, demography and epidemiology. Again, this has been recognized in India as evidenced by assigning each medical college the responsibility for the delivery of primary health care services of three rural development blocks. However, the success of this program has been variable.

Some innovative teaching programs have shown that medical students can learn how to carry out basic demographic surveys, cross sectional morbidity surveys, and small scale health interventions during three to four week blocks spent in the Community Health Department. During these blocks at various times during the medical school curriculum, the students gain an understanding of the principles of epidemiology, demography, statistics and public health. They also start acquiring the skills necessary for participating in the delivery of effective primary health care services.

The attitude to primary care services exhibited by their teachers in the more traditional subjects of clinical medicine will also influence the medical students' approach to primary health care and related subjects. Ample opportunity usually exists in the clinical inpatient and outpatient setting to teach the student about the functioning and utilization of the primary health care services.

Monitoring and evaluation

Monitoring and evaluation is of prime importance in the next phases of mortality decline and improvement in health status. However, as mortality rates decline, in part in response to specific interventions aimed at improving child survival, these cause specific patterns may be different from those seen in the past at comparable mortality levels. High quality ongoing surveillance, supplemented by periodic surveys using the post mortem interview technique ("verbal autopsy"), can be a valuable tool both to document changes and to serve as feedback to the health workers and health professionals at all levels of the health system. While service statistics serve an important function in monitoring aspects of the activity or output of the health system, independent surveys and surveillance reflect the outcome of this activity, the impact on the population served.

Conclusions

Most of the above interventions are not only applicable to the postneonatal period. However, focusing on this age group can be helpful since this short time period represents many crucial changes for the child.

Effective implementation of the following interventions is likely to have the greatest impact on postneonatal mortality:

i) measles vaccination;
ii) oral rehydration programs; and
iii) early diagnosis and treatment of acute lower respiratory tract infection (pneumonia).

The degree of success of these interventions can be expected to be greater if:

i) women's education levels increase;
ii) the nutritional status of young children improves;
iii) family planning programs continue to be emphasized; and
iv) medical education becomes oriented toward primary care and epidemiology.

The focus of this paper has been on interventions which affect postneontal mortality rates; however, these interventions may also have a positive impact on the health of the children who live. Nutritional status is affected by many of the diseases which also contribute to deaths among infants, hence prevention or appropriate treatment of these illnesses may have an effect on overall health and nutritional status. An example is measles vaccine which reduces the malnutrition which often follows measle infection, and prevents the post-measles pneumonia and diarrhea responsible for many measles related deaths. On the other hand, there are other interventions which may result in the prevention of a death; e.g., oral rehydration therapy, which may still leave the surviving child malnourished following an episode of diarrhea. This is especially the case if food intake is not augmented during and after the diarrheal illness. General health and nutritional status are unlikely to improve solely as the result of more effective health services, improvement in socioeconomic status will also play a crucial role.

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Determinants of Postneonatal Mortality

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Infant mortality rate (IMR) is considered as the single most powerful indicator of health and quality of life in a country. This, in recent years has even been incorporated as an indicator of quality of life (physical quality of life index)[1]. Demographers describe it as a very sensitive index because it is the largest single age group mortality due to unique childhood diseases which can be attacked by specific, cost effective health programmes. While infant mortality, which at present is hovering around 100/1000 live births, registered an impressive decline in the first five to six decades of the present century, during the last three decades, the decline has been rather slower[2]. In India, IMR varies from state to state with Uttar Pradesh recording the highest (160/1000) and Kerala the lowest (40/1000)[3] while in most of the developed countries and even in many developing countries, it is reported as less than 20/1000.[4]

The World Health Organization had recommended that by the year 2000 AD, the IMR should be reduced to below 50/1000,[5] though the Ministry of Health of the Government of India had set the targets of bringing it down to 87 by 1990 and less than 60/1000 by the year 2000 AD for the country as a whole. The success story of Kerala in India, despite high density population, low nutritional intake and low per capita income, and also from countries like Sri Lanka, Cuba and China, proves that IMR can be reduced substantially without even substantial enhancement of GNP and overall development.[4]

The infant mortality rate (IMR), though an important indicator of the development of a country, is not enough for the planning and institution of appropriate strategies. The reduction of IMR to the committed targets is a major challenge to the health care providers of this country. It is imperative to know the correct causes of deaths and their relative frequencies so as to plan and implement cost effective strategies. One of the major constraints in India at the moment is the lack of uniformity and reliability of records of vital events like births and deaths. Although reporting and recording of births and deaths is compulsory by law in India, at present this responsibility is relegated to the often illiterate village choukidar who does not recognize the importance of the accuracy of vital events. Cause specific mortality data is only provided from certain research projects which are documentations by highly motivated professionals adequately backed up by laboratory and pathological services. However, that kind of service is virtually impossible at community levels. Based on recall of the symptom complex after death, worthwhile information can be generated at the community level by imparting special training to even the basic level community worker[7]

According to the current estimates, approximately 50% of the IMR is accounted for by deaths in the neonatal and postneonatal periods each. Although the determinants of mortality are different in the two periods, these differences are not given the appropriate considerations which they deserve.

In the document prepared by the Director General of Health Services, India, regarding Health Information of India[8], although Infant Mortality Rates are mentioned, when listing the relative frequency of causes of death, the grouping of age become 0-4 years instead of neonatal, postneonatal and 1-4 years, thereby diluting the relative value of the crucial 0-1 group which has the highest mortality.

Table 1 gives the comparative frequency and causes of postneonatal mortality in our countries. Nearly twenty-two diagnoses have been enlisted as the causative factors of infant mortality in various studies spread over two decades. Because of lack of uniformity in diagnosis and inappropriate reporting, there is no clarity in the causes of infant mortality. For example, malnutrition as cause of death has been reported from 1.4 to 30.1%, low birth weight has been figured varying from 3.0 to 57.5%. Similarly, pneumonia as the causative factor in mortality has been recorded from 3.9 to 37.5%, and so on. However, if one was to simplify the causes so that they could become more useful for application in the community and also easily understood by a basic worker, one could short list the diagnoses to six or seven major causes. This would also be important for planning strategies for reduction in IMR and also evaluating the impact of various programmes.

Table II shows the result of the same studies with regrouped diagnoses as suggested. With this format, list of diagnoses has been shortened to one-third of the original which are also understood by the majority of trained and semi-trained workers.

Table I

Percentage Distribution of Causes of Deaths

Causes	Shah 1987[9]	Mohan 1988[10]	Sriniyasa 1969[11]	Reddajah 1975[12]	Kumar 1976[13]	Pratinjdhi 1978[14]	Bhandari 1988[15]
Malnutrition	1.4	4.2	2.5	30.1	23.5		
LBW	57.5	7.8	14.9		3.0	21.5	
Diarrhoea	5.4	17.8	24.6	19.0	8.0		31.0
Fever					16.8		3.1
Pneumonia	3.9	17.1	12.4	31.7	30.2		37.5
Septicemia	5.7	6.4	3.7				
Meningitis		5.7	3.7				
Aspiration pneumonia		8.5					
Infections						37.8	
Infectious diseases							9.3
Measles					6.4		6.2
Typhoid				11.1			
Tetanus	7.9	8.5	4.9		0.3		
Asphyxia	2.8	4.2	4.9			8.4	
Intracranial injuries	5.4	2.6					
Feeding problems						7.8	
Fits	4.2				2.0		6.2
Congenital Malforma-tions	2.5	7.8	8.7		4.0		
Liver diseases					3.0		
Sudden deaths						7.8	
Accidents	0.2					2.2	
Others	2.2	7.8		7.2	2.4	9.7	6.3

Table II

Revised Table:
Percentage Distribution of Causes of Postneonatal (IM) Deaths

Causes	Shah 1969	Mohan 1975	Srinivasa 1976	Reddaiah 1978	Kumar 1982	Pratinidhi 1987	Bhandari 1988
Malnutrition/ LBW	58.9	12.0	17.4	30.1	26.5	21.5	
Diarrhoea	5.4	17.8	24.8	19.0	8.0		31.0
Pneumonia	3.9	25.6	12.4	31.7	30.2		37.5
Infections/ fever	5.7	8.5	3.7		16.8	37.8	9.3
Fits	4.2	5.7	3.7		2.0		6.2
Congenital malformations	2.5	7.8	8.7		4.0		
Infectious diseases	7.9	8.5	4.9	11.1	6.7		6.2
Others	5.2	14.8	4.9	7.2	5.4	35.9	6.3

Other major determinants of child survival or infant mortality are socioeconomic, cultural and environmental which may not have an immediate bearing on child mortality but are crucial factors responsible for chain reactions. Gandotra and Das[16] in their study in Gujarat found maternal age, child's sex, birth order, birth interval, maternal education, socioeconomic status of the family, housing conditions, maternal calorie consumption and postnatal care as important determinants of infant mortality.

Table III gives the list of various determinants for infant and postneonatal mortality relevant to Indian context. Bhandari et al (1988)[15] in their study, while agreeing with most of the infant survival determinants, also found backward class as an important factor in infant mortality. Kumar et al (1981)[17] found maternal attitude towards breast feeding as a crucial factor for child survival. In fact they recommended exclusive breast feeding for at least four months for better child survival. Similar observations have been reported by Registrar General's Report on IMR and other investigators. These factors would require an integrated multi-disciplinary attack for overall improvement in the basic milieu of the community at-large for achieving a reduction in infant mortality. Jain (1988)[18] in his monogram on Infant Mortality in India, has categorized the determinants operating at individual levels, household and village level and at community level. These determinants affect the child survival through one or more factors. All these factors are a conglomerate of the physical, social and economic environment, like housing conditions, toilet facilities, crowding, drinking water, source of fuel, lighting and social environment, affected directly by the mother's education, age, parity, household income and inter-pregnancy interval, etc. Factors affecting the individual level may be medical or non-medical, like feeding practices, general environment, antenatal care and nutrition of the mother, immunizations of the

mother and child, and efficient, effective and prompt medical care of the child in preventive and curative medicine.

TABLE III

High Risk Factors for Infant Mortality

1.	Maternal age:	Less than 19 years More than 30 years
2.	Sex of the child:	Female for postneonatal mortality
3.	Birth order:	1st born or beyond 4th
4.	Birth interval:	Less than 18 month
5.	Maternal education:	Illiterate or below primary
6.	Socioeconomic status:	Poor classes have higher mortality
7.	Housing conditions:	Inverse relation with poor housing and crowding.
8.	Maternal calorie consumption:	Less than 1800 calorie
9.	Postnatal care:	Inverse relation with quality of postnatal care.

There is absolutely no doubt that infant mortality is unacceptably high in our country and if the recent trends are any indications, we are way behind in our targets for reducing this colossal wastage of human life. Many strategies like ORS, immunization programmes, management of ARI, etc., have been successfully tried as pilot projects and even on large scales. Appropriate and cost effective acceptable strategies must have close monitoring for assessing the impact of interventions. There is a vital need for strengthening the records and reporting of vital events, of causes of deaths and of important determinants at the individual, village and community level. Accurate records would also help in the selection of priorities based on the magnitude of the problem, current knowledge, economic feasibility and equally important cultural acceptability of the intervention strategy. From various studies and also reporting of the Registrar General, it is quite clear that the common causes of deaths in the postneonatal period are diarrhoeal diseases, respiratory infections, LBW and malnutrition, febrile illnesses, congenital malformations, infectious diseases, particularly measles, etc.[7,9-15,19] Many strategies have been tried to tackle these problems and now they must be implemented with full vigour at PHC level with full support of referral hospitals.

SCOPE IN NEXT DECADE

Strategies for the next decade should be preferably split into immediate and long-term strategies for quicker results and long term sustained effects. Immediate attention should be focused on:

a) Improvements in records and reporting with improvement of managerial skills at all levels of the health care system.

b) Records and reports of infant mortality and of causation must form the basis of in-service training of all levels of workers so as to improve the training and perception of health and para-health workers.

c) Adequate impetus must be provided in health care programmes at all levels of care keeping infant mortality as the main target. Apart from family planning, true emphasis must be given to family welfare with emphasis on antenatal care, natal and postnatal care, ORS programmes, ARI programme and immunization programmes. In this aspect, not only quantity needs to be looked at but the quality of services must get adequate emphasis.

d) Appropriate attention must be given to research in the fields of health care delivery systems, promotion of health services, uniformity of records, especially pertaining to the causation of infant mortality, and the managerial issues of health care delivery.

e) Promotion of breast feeding practices and the issues involved in prevention of malnutrition must be strengthened. Involvement of mass education media, voluntary agencies, anganwadis and energizing the existing health infrastructure in this regard requires urgent action.

On a long-term basis, serious consideration needs to be paid to budgetary constraints in the delivery of health care. Apart from this, there is need for multi-pronged thrust towards behavioral, social and cultural development. Some of the targets include:

i) Enhancement of the status of women at large with special emphasis on rural women.

ii) Female literacy and employment augmentation would reduce infant mortality and improve the lot of children. Equal status of women with preferential employment would provide confidence to women. This would also affect the now existing inequality of medical care sought for the female infant.

iii) Special needs of pregnant and lactating women in terms of rest and nutrition would help in the reduction of LBW babies, prevention of malnutrition and reduction in disease episodes of children.

iv) Inter-sectoral development so as to improve the health care delivery system. Special emphasis needs to be given to the provision of portable water, safe disposal of waste, hygiene and cleanliness.

v) Augmentation of community involvement in matters of health. This would also help in breaking the barriers of beliefs and customs of the community.

vi) Expansion of health services with special reference to antenatal, natal and child care. Strengthening the existing infrastructure should have adequate emphasis on means of transportation, communication and referral services.

vii) Appropriate strategies must also be adopted to involve the private sector of the health delivery system in reaching national goals. In this context, emphasis must also be paid to the in-service training and periodic crash courses towards child health and national health needs.

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Sociodemographic Determinants of Infant Mortality

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Social and demographic characteristics have been known for many years to be important determinants of child survival or conversely of infant mortality. Investigations in many countries of the developed world decades ago have established numerous demographic and social indicators as important predictors of infant deaths, among these, education, income, housing, urban vs. rural residence, mother's age, parity, ethnic background, marital status, and religion. Not only do these social and demographic characteristics predict the risk of infant mortality, but they are also predictive of other birth outcomes such as stillbirths, perinatal mortality and low birth weight. Not unexpectedly, many of these same variables have been shown to predict also the risk of infant mortality among populations in the developing world. Poor and disadvantaged populations throughout the world experience higher rates of infant mortality as well as higher rates of other poor birth outcomes, including low birth weight.

With your indulgence, let me briefly refresh your memory and highlight some of the key determinants of child survival which are of relevance to this meeting. Data from my presentation are derived from numerous published sources from a variety of different populations in the developing world, predominantly Asia, with some data from India as well. I have used in my discussion of the Indian data the Survey on Infant and Child Mortality 1979,[1] from the Office of the Register General, India, Ministry of Home Affairs, New Delhi, which was conducted as part of a number of special activities during the International Year of the Child. This survey, which as I mentioned was carried out in 1979, was conducted in about 3700 units of the sample registration system.

The evidence for the increase in infant mortality rates among very young and older women is overwhelming. We are very familiar with the U-shaped curve showing the lowest infant mortality at maternal ages between 20 and 30 years of age and an increase for younger and older maternal ages. This has now been documented for numerous developing countries but is also true for developed countries.[2] The increase in infant mortality among very young and older women is present even though the overall infant mortality rate of the various countries may differ significantly.

Young maternal age is also related to an increased risk of low birth weight infants both in developing and in developed countries. There is an increased risk of chromosomal aberrations among children born to women who are 35 years or older.

The reasons for this increased risk of infant mortality associated with young and old maternal age are complex. The higher infant mortality among very young mothers is related to the fact that some of them are not fully grown and

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therefore their infants tend to be smaller. As young mothers, they may be poor and are inexperienced in dealing with a young child. Among older women biological factors are involved regarding the increased risk of chromosomal aberrations with increasing maternal age. In addition older maternal age may be confounded with higher birth order which also contributes to an increase in infant mortality.

Children of very young mothers also are at increased risk of post-neonatal mortality.

Infant mortality is related to birth order.[2] The usual pattern is an increased mortality for first births, a lower infant mortality for second and third birth orders and then a gradual increase getting progressively steeper at higher birth orders. First births are also associated with an increased risk of low birth weight. All of these relationships hold for both developed and developing countries and apply even in countries where overall infant mortality rates are considerably lower.

There is a strong association between birth spacing or birth interval and infant mortality.[3,4] The infant mortality is considerably higher for children born after a short preceding birth interval than a longer birth interval. Both neonatal and post-neonatal mortality are affected.[5] Clearly this relationship is confounded by a number of other variables but still persists after accounting for differences in such factors as maternal education as a measure of social class or occupation as well as maternal age.[4] Some studies have found that short birth intervals were associated even with higher mortality throughout the second year of life.

The death of a preceding child sometimes shortens the birth interval because of the discontinuation of breastfeeding and subsequent conception or because the family wants another child soon to replace the one lost. Even after controlling for these effects the association between short birth interval and high infant mortality continues to persist.[4]

The factors involved in explaining the association between birth interval and infant mortality include competition for care and limited resources, including that of the mother who has to tend for two small children at the same time. In addition, there may also be biological effects involved particularly if several children are born in relatively rapid succession leading to what some have referred to as the maternal depletion syndrome.[6] This is really malnutrition in women who have experienced a repeated drain of their nutritional status through several pregnancies and the subsequent experiences of breastfeeding with increasing deterioration of their nutritional status with each successive closely spaced pregnancy. One of the most common manifestations of this depletion is seen in the strong relationship between high parity and anemia. One reference, for example, from India suggests that while anemia was present in 21% of women who gave birth to their first child it was present in 40% having their fourth or later child.[7]

There are marked differences in the infant mortality rate in the various states of India and consistent differences by rural vs. urban residence (Table 1). Among Indian states, Kerala reports a rate of 39 per thousand which is significantly lower than the next lowest states, namely Jammu and Kashmir and Maharashtra which report rates of 70 per thousand or 75 per thousand.[1] The

highest rate was reported for Uttar Pradesh where it was 167 per thousand with India having a rate of 126 per thousand overall. The rural/urban differential was present in every state. For all of India, the rural rate was 136 per thousand and the urban 71 per thousand. Kerala had the lowest rate both for rural as well as urban areas.

Table 1

Infant Mortality Rates for Selected Major States in India
1978 (Rate/1000 live births)

State	Rural	Urban	Total
Andhra Pradesh	120	62	112
Assam	120	86	118
Haryana	116	59	109
Jammu and Kashmir	76	28	70
Kerala	42	26	39
Maharashtra	84	56	75
Orissa	137	80	133
Uttar Pradesh	172	110	167
India	136	71	126

SOURCE: Survey on Infant and Child Mortality, 1979

We see marked differences consistent for both rural and urban areas in the rate of infant mortality by maternal education (Table 2). Consistently women who are illiterate experience the highest infant mortality rates among their children and women with a primary and higher education, the lowest. Similar differences in risk are present in Kerala (Table 3). Children of illiterate women from the rural area have an infant mortality rate of 55 per thousand and a low rate of 21 per thousand when their mothers had at least primary school education and higher in the urban areas. It appears that the rural/urban difference in rate of infant mortality by maternal education is much less for Kerala than for India as a whole.

Table 2

Infant Mortality by Maternal Education
1978 (India)
(rate/1000 live births)

Maternal Education	Rural	Urban
Illiterate	145	88
Below primary	101	57
Primary and higher	71	41

SOURCE: Survey on Infant and Child Mortality, 1979

Table 3

Infant Mortality by Maternal Education
Kerala, 1978

Maternal Education	Rural	Urban
Illiterate	55	29
Below primary	44	40
Primary and higher	29	21

SOURCE: Survey on Infant and Child Mortality, 1979

There are marked differences in the education level of women in different states of India (Table 4). Literacy rates are highest for women in the state of Kerala which also happens to have the lowest infant mortality rate (Table 5).

Table 4

Percent Distribution of Education Level
1978, India
By Sex and Urban/Rural

Level of Education	Sex	Rural	Urban
Illiterate	Male	54.7	28.0
	Female	79.1	47.0
Below primary	Male	26.3	25.6
	Female	14.5	24.4
Primary and Higher	Male	19.0	46.1
	Female	6.4	28.6

SOURCE: Survey on Infant and Child Mortality, 1979

Table 5

Percent Distribution of Level of Education
Kerala, 1978
By Sex and Urban, Rural

Level of Education	Sex	Rural	Urban
Illiterate	Male	23.9	17.7
	Female	35.7	24.3
Below primary	Male	35.1	33.6
	Female	33.4	36.4
Primary and higher	Male	41.0	48.7
	Female	30.9	39.3

SOURCE: Survey on Infant and Child Mortality, 1979

A follow-up study from Lucknow University demonstrates differences in infant mortality rate by caste status.[8] Women of upper Hindu caste status have the lowest infant mortality rate and women from the lower caste status, the highest. The difference in infant mortality by caste status was seen both for neonatal mortality and post-neonatal mortality as well. The same follow-up study also reveals the well known differential in infant mortality by years of schooling of the mother. Mothers with 14 or more years of education have only one-fourth of the infant mortality rate among their children than mothers with no education. Again, the relationship of schooling to infant mortality is for both components of infant mortality, namely neonatal and post-neonatal mortality. Similar differences in infant mortality can also be found by father's occupation or income with the higher education or higher income level usually associated with a lower infant mortality rate.

The status of a woman is related to her number of births. In a recent report by the Population Crisis Committee about the status of women, a clear relationship is shown between the number of births per woman and the rankings of women's status.[9] The rankings of women were based on numerical rankings in five areas which include health, marriage and children, education, employment and social equality. The lower the ranking of women, the higher the number of births per woman. Those ranking extremely poor in status had an average of 5.9 births as compared to 1.9 births for women ranked as very good.

The nature of the relationship between demographic and social characteristics and infant mortality is complex and it would be helpful to have a better understanding of the relationship before planning specific interventions. Traditionally in many developing countries women tend to be young at marriage and therefore tend to have their first child at a young maternal age. Thus, women may have their first child before they are fully physically grown and at a time when they lack emotional maturity and life experience (Table 6). It follows that these women have little if any education. Conversely, women with more education tend to marry later. They tend to be older at the time of the birth of their first child and more experienced and emotionally more mature. One possible intervention is raising the age of marriage which was done in India in 1978 when age of marriage for women was raised to 18 years. I have not been able to find any information about the effect of this legislation on the practice of marriage at young maternal age.

Table 6

Infant Mortality by Age at Marriage
India, 1978
(Rate per 1000 livebirths)

Age at Marriage	Rural	Urban
Below 18	156	88
18-20	132	67
21 and above	90	46

SOURCE: Survey on Infant and Child Mortality, 1979

Maternal education is one of the more interesting variables. It is probably not coincidental that the state of Kerala which has the lowest infant mortality rate of any of the states of India has the highest level of education of its women.

Caldwell believes that education of women may increase their desire and ability to accept responsibility in seeking and finding non-traditional methods of health care and move away from the more traditional cultural patterns and beliefs.[10,11] He also postulates that maternal education may result in a push for better and safer drinking water, toilet arrangements and even for a more equitable allocation of food among various members of their families. He observed that traditional societies have a practice of eating separately. Those who eat first get the most and do not know what those who eat later will get. This custom presumably changes somewhat with increasing education of the mother or family. As a result families begin to eat together. This results in a more equal distribution of food and presumably more food for the children. Caldwell also feels strongly that the development of a more modern health care system would be a waste unless it is coupled with an equal emphasis on raising the level of education. Without improving education these expended and improved health services may not be utilized. The importance of education is also highlighted by the fact that urban/rural differences in child mortality when controlling for parental education become smaller despite the fact that living in rural areas in most societies equals less access to health facilities. I have quoted Caldwell extensively here in order to provide a flavor for the complexities of the interactions between the variable of maternal education and infant mortality and the different types of behaviors which may be related to maternal education.

Trussell and Pebley have estimated that about one half of the infant deaths and almost half of the maternal deaths in the developing world could be avoided by a strategy which would avoid four of the previously discussed risk factors; namely, being too young, that is less than 18 years of age, being too old, that is more than 35 years of age, having too many pregnancies, that is more than four births, and having them occur too close together, that is less than two years apart.[12] A strategy designed to avoid these four risk factors could reduce infant deaths from 10.5 million in developing countries today to about 4.9 million and maternal deaths from 450,000 to 250,000 per year. If women would only have children between the ages of 20 and 34, infant mortality would be reduced by 5%. There would be a further decline by 3% if birth orders were no higher than 3 and by 10% if all births were at least two years apart. The total reduction in infant deaths is due to the reduction in mortality by the avoidance of these four risk factors, but also the reduction in the number of births which would come about as a result of the changes in childbearing patterns.

In considering possible interventions to affect a reduction in maternal and infant deaths, family planning clearly must play a key role. The United Nations Children's Fund has endorsed family planning as being of very high priority in improving child health. The Alma Ata conference in 1978 listed among its eight basic components of primary health care, maternal and child health care including family planning.[13] By preventing higher risk pregnancies

through effective family planning, we can reduce maternal and infant mortality substantially.

The World Fertility Survey provides ample evidence that women in numerous countries including countries in Asia and the Pacific may be receptive to family planning. For example, in response to a question to currently married fecund women whether they wanted no more children, the range of women wanting no more children was from a low of 30% in Nepal to a high of 72% in Korea (Table 7).[6] For Bangladesh and Sri Lanka it was 61%. Data from the Contraceptive Prevalence Survey from 1978 to 1981, support these results (Table 8). In that survey of currently married women ages 15 to 44 for Bangladesh, for example, 45% of women wanted no more children.[6] For Korea it was 74%, for Nepal, 36% and for Thailand, 63%. A survey of contraceptive use among married women of reproductive age of various Asian countries reported a low of 5% using contraception in Pakistan to a high of 56% in Thailand (Table 9). In Bangladesh 19% reported the use of contraception, 26% in Indonesia, 7% in Nepal, 36% in the Philippines and 55% in Sri Lanka. Clearly there are many women in these countries who indicate a preference to have no more children who are currently not covered by contraception.

Table 7

Percentage of Currently Married Fecund Women
Wanting No More Children
World Fertility Survey Results, 1974-1980

	Ref. No.	Year of Survey	% Wanting No More Children	% Not Wanting Last Child or Current Pregnancy
Asia & Pacific				
Bangladesh	268	1975	61[1]	NA
Fiji	268	1974	50	28
Hong Kong	230	1976-77	69	NA
Indonesia	268	1976	39	17[2]
Korea, Rep. of	268	1974	72	37
Malaysia	268	1974	43	NA
Nepal	268	1976	30	NA
Pakistan	268	1975-76	49	NA
Philippines	405	1978	54	27
Sri Lanka	268	1975	61	34
Thailand	268	1975	57	NA

[1]Some women were asked: "Do you want another child soon?"
[2]Based on responses of ever-married women

SOURCE: Population Reports, No. 27, May-June 1984

Table 8

Percentage of Currently Married Women Age 15-44
Wanting More Children Now, More Children Later,
or No More Children
Contraceptive Prevalence Survey Results, 1978-1981

	Ref. No.	Year of Survey	% Wanting: More Now	More Later	No More	No More or More Later	Unknown
Asia & Pacific							
Bangladesh	110	1979	14	36	45	81	5
Korea, Rep. of	334	1979	19	6	74	80	1
Nepal	110	1981	27	28	36	64	9
Thailand	110	1981	9	26	63	89	2

Source: Population Reports, No. 27, May-June 1984

Table 9

Percentage of Currently Married Women of Reproductive Age
Using Contraceptive Methods
Representative Sample Surveys, 1975-1982

	Ref No.	Year of Survey	% Using Contraception
Asia & Pacific			
Bangladesh	39	1981	19
Fiji	77	1974	41
Indonesia	77	1976	26
Korea, Rep. of	334	1979	54
Malaysia	77	1974	33
Nepal	349	1981	7
Pakistan[1]	77	1975-76	5
Philippines	77	1978	36
Sri Lanka	518	1982	55
Thailand	261	1981	56

[1]Respondents were asked about use only after they spontaneously mentioned a contraceptive method in knowledge section of survey.

SOURCE: Population Reports, No. 27, May-June 1984

Conclusions and Recommendations

Family planning must be an important strategy in affecting a reduction in infant and maternal mortality. If focused around the prevention of high risk pregnancies as defined in this presentation, it may have a significant impact. Family planning is cost effective and can be implemented as part of primary health care services.

The status of women, their role in society, and the place that they assume in the tradition of the country are powerful forces which need to be addressed if we hope to have a significant impact in reducing infant as well as maternal mortality. Raising the level of education and educational opportunities for women in conjunction with raising the age of marriage in and by itself will result in delaying childbearing and reducing the number of births.

I like to recommend that an effort be made at determining the effectiveness which raising the age of marriage for women to 18 years in 1978 in India has had in reducing early childbearing. We may assume that changes would come about more readily in urban rather than rural areas and least likely in the more traditional segments of society.

Finally, combining an attempt to raise the status of women in society through a sustained educational effort of the total community coupled with better educational opportunities for women and delaying age of marriage with a family planning program which meets the needs of that community would offer a challenge and opportunity to evaluate the effectiveness of these various key components in effecting an improvement in the status of women by raising their level of education and delaying age of marriage and affecting a reduction in high risk pregnancies.

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CULTURAL DETERMINANTS OF INFANT MORTALITY

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Until recently study of mortality has remained largely a domain of medical professionals or those of demographers. Social scientists have generally remained apathetic to the issue largely because it was presumed that mortality control perhaps could be achieved only through proper medical intervention, either in the form of preventive or curative care. Significance of non-medical interventions for a medical purpose such as reduction in infant mortality is rather a newly acquired wisdom and has stimulated many social scientists to take interest in the study of mortality particularly determinants of infant and child mortality.

One of the reasons for the lack of interest in the study of mortality is the absence of a proper conceptual framework. A review of the literature on fertility clearly reveals that number of studies increased significantly when Davis & Black (1956) identified the set of eleven intermediate variables through which any change in fertility could be influenced. Bongarts (1978) further reduced the list by giving four "proximate' variables; namely, age at marriage, use of contraceptive, breast feeding and frequency of abortion which could explain most of the variation in fertility levels among the societies. Bongaart's proximate variables are now being extensively used for studying the fertility differentials all over the world.

In the study of mortality, until 1980 no visible efforts were made to develop a comprehensive conceptual framework which could help in identifying a set of intermediate/proximate variables through which, and only through which, social, cultural or economic factors can influence mortality (Nag 1988). However, since then a number of attempts have been made in this direction. Mosely & Chen (1984) identified a set of 14 intermediate variables which they believed have direct influence on the risk of morbidity and mortality. Jain (1988) attempted to improve it further and forwarded the following six proximate variables for determining level of infant mortality in a population:

1. Prenatal medical care - Immunization of pregnant mothers and treatment of infections during pregnancy

2. Prenatal non-medical care-maternal health including nutrition during pregnancy

3. Medical care at the birth of the child - General hygiene including the use of sterilized instruments to cut the umbilical cord

4. Postnatal non-medical child care - Infant feeding practices, for example breast feeding for at least six months

5. Postnatal preventive medical care - Immunization

6. Postnatal curative medical child care - Incidence and treatment of illness and effectiveness of treatment

also important (or perhaps more important) to explore that in a given setting, why a proportion of the pregnant women seek and avail the prenatal care while the others do not? Similarly, despite easy and cheap availability of public immunization facilities, why only a small proportion of children are fully protected against the six major killing diseases, while others either are not immunized at all or drop out after taking one or two doses. Unless we push our inquiry to this level, the significance of the infant mortality studies for planning purposes perhaps may remain limited.

The social dynamics, and the processes through which the suggested proximate variables are influenced, can be better understood by undertaking micro-level case studies using anthropological approaches rather than conducting large scale cross-sectional surveys. Perhaps an integration of both the approaches will yield a much better and comprehensive knowledge than either of the two approaches in isolation (Khan 1988). Study of some of the cultural factors which could help in understanding the level of differential mortality and processes through which the proximate variables are influenced, are discussed below:

Cultural factors influencing infant & child mortality

Low age at marriage: Among various social and cultural factors, continued practice of marrying daughters at an early age in India contribute significantly both to the maternal mortality as well to the infant mortality. As it has already been well documented, early marriage leads to early child bearing, causing complications like cephalopelvic disproportion resulting in consequence like prolonged or obstructed labor, ruptured uterus, prolapsed uterus, infection, hemorrhage and in some cases even death (Population Reports 1988). While early marriage/child bearing is a serious health hazard for women, it also contributes significantly in maintaining high level of infant mortality.

A review of literature clearly indicates that the health of infants is affected by their mother's age when they are born. Infant deaths are less common among women between the ages of 20-34 than among older or younger women (Table 1).

Table 1: Infant Mortality by Maternal age in Selected Countries 1968-70

Maternal age	Brazil	El Salvador	California USA
19 or below	104	120	26
20-24	68	84	16
25-29	53	73	15
30-34	61	81	17
35+	67	94	18
All ages	65	88	18

Source: Pan American Health Organization

In a recent article, Nag (1988) apart from Mosely and Chen and Jain's models reviewed a number of other frame works (Gandotra and Das 1988, Talwar 1988, Madadevan 1986) which have been suggested or used for analyzing differential infant child mortality and concluded that the former two models have better potential for being used as a framework. He tried to integrate Jain's and Talwar's models and forward a modified version which he believes is more appropriate to study infant mortality. The following gives the nine proximate variables listed by Nag (1988) to study infant mortality.

A. Variables operating at conception

1. Reproductive health of mother at conception (e.g., nutritional status and other indices of maternal health)

2. Genetic constitution of infant (e.g., reflecting congenital abnormality)

B. Prenatal variables

3. Prenatal medical care (e.g., immunization of pregnant mother)

4. Prenatal non-medical care (e.g., nutrition and workload during pregnancy)

C. Factors operating at delivery

5. Medical care at delivery (e.g., attendance by medical, paramedical, or other personnel)

6. Non-medical care at delivery (e.g., hygienic and sanitary conditions)

D. Postnatal factors

7. Postnatal medical care (e.g., immunization of infant, treatment of illness)

8. Postnatal non-medical care (e.g., infant feeding practices)

9. Accidental injury (e.g., fire, flood, boat accident)

Availability of these models has generated a new interest in the study of determinants of infant and child mortality, and it is expected that in the near future more and more studies will be undertaken to measure the values of these proximate variables and the extent they influence infant and child mortality in a given social setting.

Understanding of these linkages are important, but perhaps it will be much more significant and useful, if along with studying the linkages between proximate variables and infant and child mortality, attempt is also made to understand the social dynamics and the processes through which these proximate variables themselves are influenced. For example, it is not only important to establish linkages between prenatal medical care (immunization of mother, taking iron folic acid tablets, etc.) and infant/child mortality, but it is

As can be seen from the table irrespective of the developmental level of the country, infant death rates are about 30-40 percent higher when the mother's age ranges between 11-19 as compared to those aged 20-24 and above. It has been also observed that generally mother's age at the time of delivery influences the level of infant mortality primarily by altering the level of neonatal mortality (Khan 1988, Rao 1975, Agarwal 1978). The level of postneonatal mortality which is influenced more by the environmental conditions, cultural values and practices and the availability of medical services, is not affected to the same degree by the age of mother at delivery. Thus, if neonatal mortality which presently constitutes about 64 percent of the total infant deaths in India, has to be reduced, all efforts must be made to increase female's age at marriage and age at first birth. However, as the data shows, despite government's efforts to increase age at marriage by passing a legislative order, making 18 years as the minimum marriageable age for girls and 21 for boys, not much success has been achieved. According to the 1981 census, the median age at marriage of currently married women was reported to be only 17.4 years i.e., half of the currently married women of the country, got married before attending their 18th birthday. A time series data also reveals that the pace of increase in age at marriage is quite slow and in the last decade, i.e. between 1971-81, the increase in median age at marriage was very modest and was reported to be only one year, i.e., from 16.4 years in 1971 to 17.4 in 1981 (RGI, 1988). Some recent large scale surveys carried out in various parts of the country, do not provide any evidence that between 1981-89 female's age at marriage has registered any substantial gain. As the following table shows, even today, more than half (about 55 percent) of the girls in Bihar and Uttar Pradesh and about one-third (about 36 percent) in Maharashtra are getting married before attending their 17th birthday. This could be one of the reasons for the very slow decline of infant mortality, particularly the neonatal mortality, in the country.

Table 2: Mean age at marriage of girls in selected states

	Less than 14 years	14-16 years	17+ years
Bihar	16.1	38.0	45.9
U.P.	15.7	39.1	45.2
Maharashtra	5.6	30.7	63.7

Source: ORG Data base

This may not be out of place to mention that the national averages of vital rates or other related statistics are quite misleading as wide variation with respect to these rates prevails in the various parts of the country. For example, in 1981, the mean age at marriage for females ranged between 21.8 years for Kerala to 16.1 years in Rajasthan. Similarly in 1985, infant mortality rate ranged between a mere 31 in Kerala to a high of 142 in Uttar Pradesh. Thus, it is highly desirable that attempts should be made to identify the causes of such variations, the social, economic and cultural factors which

resist increase in the age at marriage and thereby, indirectly contribute to the continued high level of infant mortality in the country.

A recent micro-level ORG-ILO collaborate study in Uttar Pradesh reveals the following three basic reasons as to why parents decide to marry off their daughters at an early age (Khan, Ghosh and Singh 1986):

a) to conform to tradition
b) to preserve the chastity of daughters and
c) to reduce financial liabilities

a) To conform to tradition: It was observed that in the two study villages people were still following traditional values and married off their daughters before or just after puberty. It is believed that the father would be committing a grave sin if he could not marry off his daughter before or just after onset of menstruation. According to one of the informants,

> "The society will condemn us if our daughters are not married off before 15 years of age. About the father, the people will say that he must be earning out of his young daughters".

This feeling is embedded in old Hindu mythology, which suggests that a girl should be married before she attains puberty and certainly after the first menstruation. However, in the villages this feeling is more common among Brahmins and Thakurs. The Indian marriage law which forbids marriage of girls before 18 years gets little support in the rural community and as a matter of fact, the majority of the people are not aware of the law itself. For example, none of the 40 informants covered in the case study were aware of the existence of any such law. The violation of the marriage law is not only restricted to rural areas but is also quite prevalent in urban centers. For example, recently there was a controversy when a minister in Rahasthan married off his two minor daughters (Times of India, 28th May 1981).

b) To preserve the chastity of the daughters: The concern of parents for their daughters' chastity and to safeguard them against sexual exploitation also leads to their early marriage. Many informants had expressed such fears. however, they could not cite any case of sexual exploitation when asked to give concrete examples. It is very much possible that they purposely hide or avoid discussion of this issue. Fear of sexual exploitation was expressed more by the poor than the rich informants.

This fear was also expressed in a study of Andhra Pradesh and Bihar villages where more than 80 percent of the respondents wish to marry off their daughters before 19 years of age (Khan, Prasad and Mazumdar). They were against raising the age at marriage as they feared that this would result in sexual exploitation of daughters and the parents would suffer social humiliation.

These are not isolated cases. There are evidences where even the wives are not spared. Arens and Beurden (1977) in their study of Jhagrapur village have described how a rich peasant misused the poverty of a poor peasant and later his wife. Narrating the incident they write:

> ".....one night the rich peasant came to the poor peasant's house and laid down beside the woman. The poor peasant told his wife not to be afraid and not to oppose the rich peasant; after all his debts had to be paid. The woman ran away from the husband the next day,..... it is class exploitation and women's exploitation side by side".

c) To reduce financial liabilities: Increasing dowry practices also contribute to early marriage. It was observed that with the age of the girl, the amount of dowry also increases. As reported by the informants, not much dowry is required in child marriage and one might only have to pay Rs.5000/-but the expenses could shoot up to Rs50,000/- at a later date. Similar observations were made by Vohra (1983) in Mudikondam village in Tamil Nadu.

Severe poverty is yet another reason for early marriage. More often than not the daughters are considered a burden and the parents take the first opportunity to get rid of them through marriage, thereby reducing the number of mouths to feed.

Subordinate Status of Women

Subordinate status of women in society particularly in rural areas contributes significantly in supporting high level of infant mortality by influencing various proximate variables listed in Nag's conceptual framework. Subordination of women largely stem from the lack of appreciation by the society (male folk?) about their economic contribution in the welfare of the family. Even though in home a women works fourteen hours a day, she is considered only as "housewife". The economic value of her work as unpaid family worker (in farm or family business) or substitute labor for the various household activities (including collection of fuel, fetching of water and caring family animals), largely remains invisible. India with its colonial background, not only has perpetuated but to an extent strengthened the monopolistic structure of the society which attempts to optimize its profit by exploitation of the poor and weaker sections of the community. In such social setting, women who remain as invisible workers, are not valued and protected in the same way as the males who are considered as 'bread earner'. Subordination of women manifests in various ways in their life including lack of opportunities for education or acquiring vocational skill, hard and long working days within family, a general neglect in their food intake and medical care, and often restriction on their free movement outside home. Control on outside movement particularly for young women in reproductive age, prevent them from availing pre and post natal cares. In such situation it is not surprising that even today, in various parts of the country, majority of the women are not protected against tetanus. Deliveries are conducted at home, often in unhygienic condition by untrained personnel. All these practices are highly conducive for maintaining high infant mortality.

As mentioned above, subordination of women is also reflected in their hard working days over the entire year. Time use study reveals that generally women work 12 to 14 hours a day (Khan et al 1988) (See Table 3).

Table 3: Time use data of five pregnant women in a normal day

Activity	Time spent in hours				
	Kam-	Susheela lesh	Kusum	Kamla	Phool-mati
Working for wage/salary (unskilled)	10.00	-	-	-	5.30
Travelling in time to go at work place	-	-	-	-	2.00
Handicraft	-	-	2.00	-	-
Cooking & serving food	2.15	2.30	2.00	3.00	4.15
Fetching of water	0.45	3.00	2.00	1.30	1.10
Other household work like washing of clothes, cleaning, dusting, etc.	1.30	2.00	3.00	2.30	2.15
Animal husbandry	-	3.00	2.00	3.00	-
Self care/rest/gossiping/ taking food etc.	2.00	3.00	3.00	2.00	2.15
Making cow dung cakes	-	0.30	-	-	-
Child care	-	-	1.00	2.30	-
Grinding of grain	-	3.00	2.30	4.00	-
Sleeping	7.30	7.00	6.00	5.00	6.45
Crop cultivation for family (at farm)	-	-	-	-	-
Crop cultivation for others	-	-	-	-	-
Religious activities	-	-	-	-	-

Source: Khan et. al 1987

Even though they knew that certain amount of rest during pregnancy is desirable but in reality only a few fortunate get this opportunity. Rest all continue to do hard work till the pain start (Khan et. al 1987).

Earlier, traditionally pregnant women used to go to their parents house for delivery and continue to live there two or three months even after birth of the child. In parents' house, generally they are free from day to day household chores and get some rest during pre & post-natal period. It is also presumed that the parents take more care of their food and rest. However, with modernization and breaking of tradition, this practice is slowly declining and now often women deliver children in their own house rather than going to their parents house (Srinivasan 1986). In such situation most of the women do not get any opportunity to rest before delivery and at most get 30 to 40 days of rest after birth, that too if some other adult person is available in the family to look after the daily household work. As the studies show, most of the pregnant women (in fact most of the women irrespective of pregnancy status) in slums and rural areas suffer from acute anaemia, majority of them undertake hard and strenuous work with insufficient food intake. (A recent survey shows that average intake of calories of urban poor in Baroda ranged between 67 percent to 84 percent of the ICMS's recommended daily allowance for a normal

woman (Khan et al 1989).) All these taken together influence the normal growth of the foetus and often result in premature births or delivery of low birth weight babies - the two most frequent causes of neonatal mortality in India. Studies show that half of the low weight birth are still birth (Gosh 1971) and two-thirds of the babies born with a birth weight less than 1500 gram do not survive beyond one month (Bhragava 1975).

It is expected that if pregnant women take iron and folic acid during pregnancy particularly in the third trimester, the infant death due to low birth could be reduced. A study undertaken in Ballabhgarh shows that three or more visits to antenatal clinic, two doses of anti-tetanus vaccine and daily of iron and folic acid lowered the neonatal mortality rate by almost 25 per cent. (Kapoor 1982). However, due to the restriction on the free movement of women outside home and at times inaccessibility of the services, still a larger proportion of women in rural India do not get essential antenatal care. The following figures from some recent surveys carried out by ORG corroborates the above observations (Table 4).

Table 4 : Antenatal Care Services Received by Pregnant Women (percentage)

	A.P.[1] (1988)*	U.P.[1] (1988)	Bihar[2] (1969)	Maharashtra[2] (1989)
Antenatal checkup	57	30	79	91
Protection against Tetanus	22	30	33	71
Taking of Iron & Folic Acid tablets	65	29	36	62

*Figures in parenthesis give year of survey

[1] Khan & Gupta (1989) [2] Khan & Rao (1989)

Child Bearing Practices:

Some of the old practices related to child bearing like place of delivery, type of attendant, instrument used for cutting the umbilical cord, etc., are important factors causing infant death, particularly neonatal mortality. A review of literatures shows that still the majority of deliveries particularly in rural areas are conducted at home and attended by untrained dais or family members. More often than not, the place of delivery is a closed and dark room. The floor is plastered with mud mixed with cow dung. The waste cloths which are used during delivery are not always clean and hygienic. Despite extension education to encourage the use of sterilized blade for cutting umbilical cord, use of kitchen knives, sickle, sharp bamboo piece and other instruments are not

uncommon. All these practices are potential sources of infection and neonatal tetanus.

During the 1970s more than 80 percent of rural births were delivered at home by untrained dais or other family members. By 1981-83, this proportion had come down to about 73 percent (Visaria 1988). It is expected that the proportion of such deliveries in recent years must have further decreased. However, some of the recent large scale sample surveys carried out by ORG in a few states show that the decline is only marginal and still the majority of the deliveries particularly in backward states like Andhra Pradesh, Bihar, Uttar Pradesh, etc., are being conducted by untrained dais (Table 5).

Table 5 : Percentage of Deliveries Conducted by Trained Personnel and Place of Delivery

Percentage of deliveries	AP (1988)	UP (1988)	Bihar (1988)	Maharashtra (1989)
Attended by trained personnel	36	30	37	81
Conducted at institution (PHC/Sub-centre, Private clinics)	29	16	22	27

Source : Same as Table 4

Considering the fact that traditional birth attendants (TBAs) will continue to play a vital role during pre and intranatal care, the Government of India, under the Dai training scheme' is trying to train these TBAs in some basic minimum hygiene and safe delivery practices. Evaluation of the performance of trained dais shows that generally the trained dais conduct the deliveries in relatively more hygienic condition and practice aseptic methods (Kumar 1983, Khan & Ahmad 1983).

At times some of the unhygienic practices are followed upon the insistence of the family members. For example in some of the households it is insisted that for cutting umbilical cord, a knife which has been kept in the family for generations and used for this purpose, should be used. Generally those knives are old and rusted and could be easily a source of infection. A recent ORG study in UP & AP (Khan & Gupta 1989) also shows that people either prefer to contact regular PHC/sub-centre staff (ANM/LHV) for assisting delivery or seek assistance from untrained dais. The trained dais are often not approached. An inquiry about this revealed that many times when the old, aged and popular traditional dais refuse to undergo training, the ANMs to complete their target of dai training, encourage young girls or relatively unpopular dai to undergo training. These trained dais generally remain un-utilized by the community members as they have more faith in the old and experienced dais. This observation was also corroborated from a study in Bihar (Khan & Ahmad 1983).

Breast feeding & washing practice:

The important of breast milk for the normal growth of the child, particularly the effect of colostrum is well documented. Similarly the timing

of introducing supplementary food and weaning practices have significant influence on the nutritional status as well as over all development of the child. Negligence at any of these stages could cause serious health hazard for the child and could be fatal in many cases. Generally lack of proper care in feeding of the child often cause infection leading to serious diarrhea - one of the most common causes of infant death.

A review of the studies on infant feeding and rearing practices in India reveals many cultural practices which support the general practice of delaying initiation of breast milk and thus depriving the child from getting valuable colostrum.

According to the available literature generally the breast feeding is initiated at least 24 hours after birth and often after 48 or 72 hours (Visaria 1988). In some cases particularly in tribal areas, however, breast feeding is initiated within 6-12 hours. The colostrum is discarded because of the general believe that it is 'heavy' or not good for the child. The pre-lactation food includes beverages like tea, boiled water, honey/sugar/jaggery or glucose with plain water, cow or buffaloes's milk diluted with water etc. However, not much information is available how these foods are administrated or whether the water used for diluting milk or making sugar-water mixture is boiled. There is some evidence that often the mode of feeding is not hygienic as diluted milk/water sugar mixture are dipped in the mouth of the child with the help of a piece of cotton or a rag (Visaria 1988). Fingers are used to feed honey. Because of the general lack of knowledge about cleanliness and hygienic practices, these pre-lactation practices could easily cause infection and lead to diarrhea.

Similarly it has been reported that often introduction of supplement food is delayed and when introduced, it is not given in sufficient quantity to satisfy nutritional needs. Mostly, liquid supplemental food is introduced after six to eight months and generally it is diluted cow/buffalo's milk. Again not much information is available on the mode of feeding and whether the water used for diluting is boiled. However, it has been observed in rural Gujarat as well as in Uttar Pradesh that often plastic nipples are fixed to used medicine bottles for feeding children. Because these bottles have a narrow mouth, they are difficult to wash and could easily be a source of infection. It has also been reported and observed that often milk is too diluted to be nutritive enough and thus the child slowly becomes malnourished. Partly the practice of diluting the milk is followed because of the belief that cow/buffalo's milk is heavy for the child to digest, but often because of the poverty and non-availability of enough milk to meet the child's requirements. One of the reasons for prolonged exclusive breast feeding and late introduction of supplementary feeding is the financial inability of the parents to purchase milk for feeding the child.

In some of the areas, breast feeding is abruptly stopped, if the mother becomes again pregnant. Such abrupt weaning could cause serious health problems particularly if the child was exclusively breast fed. However, not many studies are available on these aspects and its consequences for the child survival and development. Often when such abrupt weaning takes place, the inter-pregnancy interval is quite short. This could be harmful not only to the last living child but also for the normal growth of the fetus. There is ample evidence that children who are born at the end of a birth interval of less than 2 years are twice as likely to die in infancy as are children born after a

longer interval. Data from Khanna study in Punjab show an infant mortality rate of 206 when the interval between births was less than 12 months as compared to 108 when the interval was 48 or more months (Gordon et. al 1967).

Summary and Conclusions

The paper reveals that persistence of high infant mortality in India, despite of major medical interventions both in rural and urban areas, is to a great extent due to non-medical reasons. The paper singles out a number of socio-cultural factors which contribute to the continuation of high infant mortality rate in India. It includes rampant poverty causing severe malnutrition to all particularly the pregnant mothers, low age at marriage and subordinate status of women. Low status of women push them to take role of unpaid family worker. Even though at home and farm they perform streneous work, often 12 to 14 hours a day, their economic contribution remains invisible. As a result they are less valued, less cared and less protected. It also prevent them to avail the benefits of development particularly education, employment and health facilities. Ignorance about proper child care (including immunization) and following traditional system in the initiation of breast feeding and weaning practices further aggrevates the situation. It appears that infant mortality in India may not fall early to the desired level unless an intersectoral coordinated effort is launched both for ensuring minimum dietary requirement to all (a problem of poverty ellivation) as well as increasing status of women in the society. To achieve the later one, participation of women in paid labour force and ensuring at least a functional litracy to all is perhaps a pre-condition. The health delivery system also needs to be restructured to make it more responsive to women's health needs in general and their reproductive health in particular. Need not to mention that the health delivery system must be made area specific as in the diverse socio-economic, cultural and demographic set up like ours, one single model can not be effectively implemented in the entire country.

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The Risk Approach in Maternal and Child Health

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INTRODUCTION

Despite considerable effort to create and improve health care services, there are still many areas in the world where access to health care is limited for most of the population. High quality medical services may, paradoxically, be available to some groups while universal coverage, at the primary level, is limited by resource constraints.

There is thus a need to make optimal use of existing resources for the benefit of the majority if the goal of "Health for All by the Year 2000" is to be achieved. As noted by Backett, Davies, and Petros-Barvazian, the risk approach is "Something for all, but more for those in need--in proportion to that need." The risk approach is both a method for establishing priorities by measuring the need of individuals and communities and a tool for improving the use of health care resources to meet those needs. The risk approach is particularly suited to maternal and child health and family planning, where promotive and preventive activities and early health care action are so important. Perinatal mortality is preventable; the prevention efforts can lead to many years of productive life.

This presentation describes our use of the risk approach in perinatal health. What began as a provocative concept in 1976 is continuing today--and will reach into the future of our health care planning and delivery systems.

PRINCIPLES AND OBJECTIVES OF THE RISK APPROACH

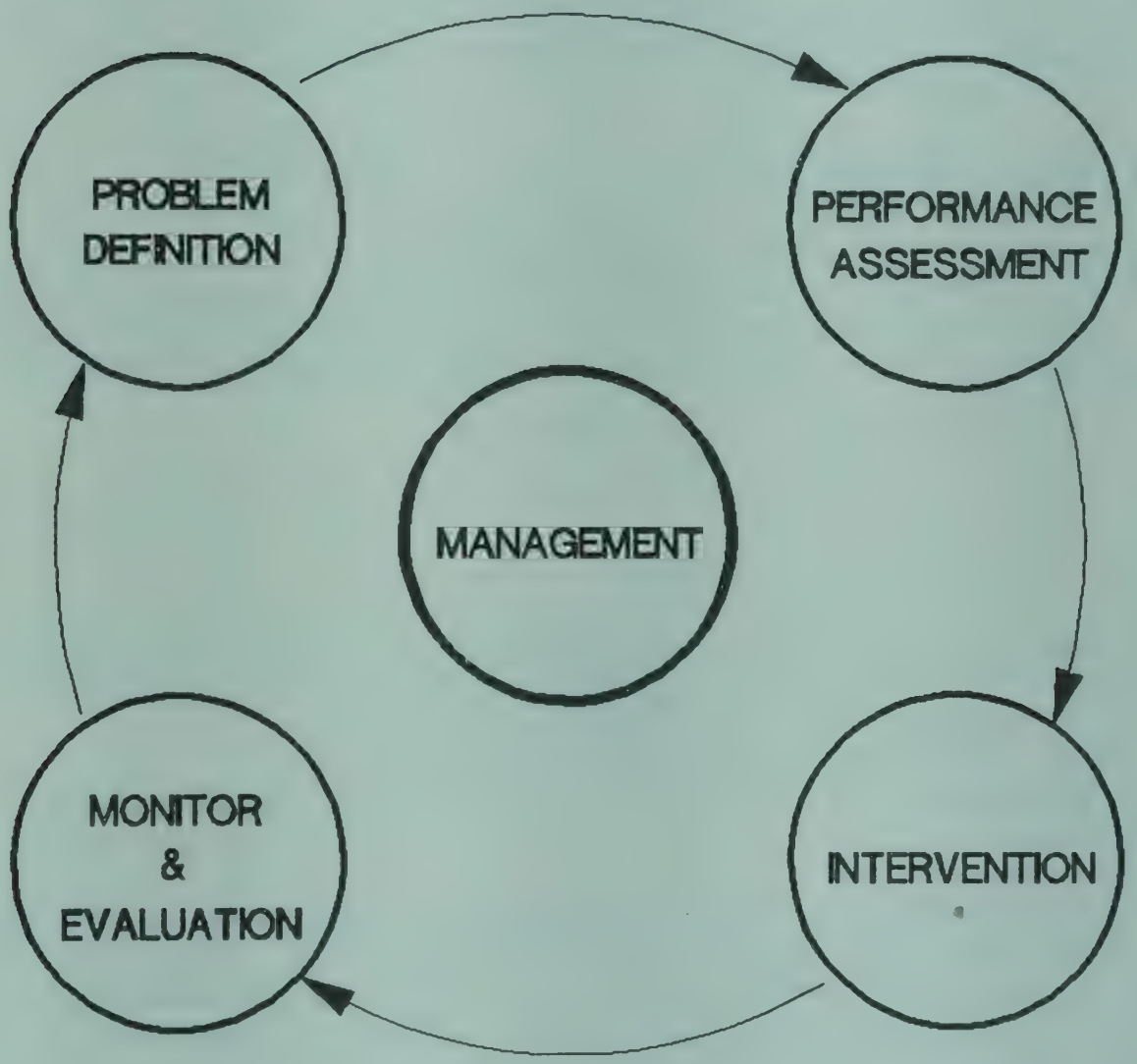
The risk approach, which is based on measurements of individual and community risks, is a managerial tool for the flexible and rational distribution of existing resources. It is also useful for developing local strategies and determining the appropriate content of maternal and child health and family planning services. As a managerial tool, the risk approach (1) measures individuals' needs so priorities can be set for delivering health care and (2) directs the reorganization of the health care system to better meet the priority needs.

The four fundamental steps in the risk approach (Figure 1) are:

1. identifying priority health problems, including risk factors associated with those problems;
2. assessing performance within the health care delivery system;
3. developing and implementing intervention strategies for modifying the risk factors and improving the performance of the health care delivery system; and
4. monitoring and evaluating the intervention strategy in terms of effectiveness, efficiency and acceptability.

Figure 1

THE RISK APPROACH IN MATERNAL AND CHILD HEALTH



Risk 1

Objectives of the Risk Approach

The risk approach presents us with a series of questions that, when answered, may begin to redress the special vulnerability to illness that handicaps certain segments of our population. Individuals at greater risk of morbidity and mortality--whether for reasons of biology, socio-psychology, environment, or economy--can be identified and then apportioned the medical resources required to meet their needs. Information is the difference that makes a difference.

Two pivotal questions are addressed by the risk approach. First, are we doing the right things? In other words, have we directed our resources toward reducing health problems that have the greatest impact on our population's health and have we selected interventions that most effectively and efficiently reduce those health problems? Second, are we doing things right? More specifically, are the activities we planned really being carried out and performed correctly?

IDENTIFYING HEALTH PROBLEMS

By quantifying the health problems that pose the greatest risk to the health of individuals and communities, we can identify those in greatest need of resources. The systems for data collection and response are not cumbersome. The risk approach requires that surveillance be adaptable, responsible, cheap and simple (Figure 2).

Methods

To define the health problem, we would:

1. measure the rate of adverse outcomes leading to perinatal mortality;
2. test whether perinatal mortality was indeed significant enough to be selected as our priority health problem;
3. define the risk factors for perinatal mortality;
4. improve the screening tool used to identify risk factors in the population.

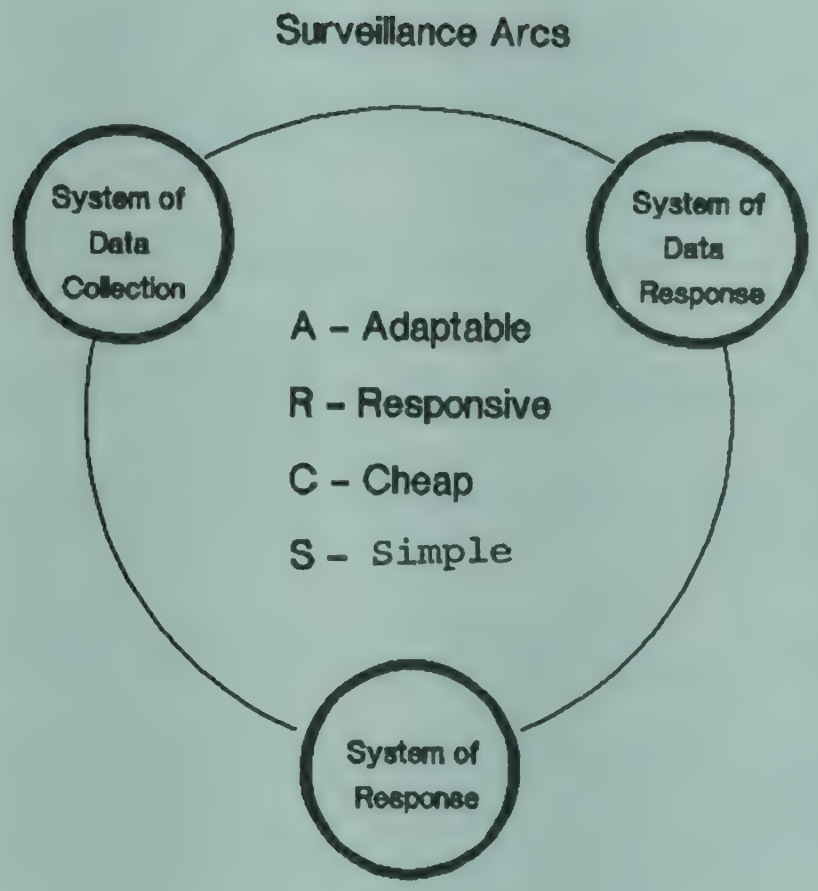
We conduct surveillance on the pregnancies of all women and record their contact with the organized health care delivery system. By monitoring the complications, both to the mother and to the infant, that occurred during pregnancy and delivery, we can plot the distribution of adverse outcomes. Rates are determined for the following: perinatal mortality, birthweight-specific mortality, low birthweight, and infant mortality.

Perinatal health surveillance requires an unambiguous definition of the subpopulation being monitored. Appropriate sample sizes are required from which to draw data from perinatal health records. We determine sample sizes based on the number of pregnant women monitored, the number of babies delivered, and the proportion of women and babies on whom data are retrieved. Several types of data are critical: general health status, adverse outcomes, and risk factors.

We can construct a profile on the health status of mothers and infants by analyzing the pregnant women's demographic and obstetrical histories. The

Information is
"a difference that makes a difference"

Every pregnancy counts,
so count every pregnancy



What are we doing that we can measure,
Instead of
What do we need to measure in order to kow what we are are doing

Every baby has weight,
so weigh every baby

rasurv1

degree of contact with health care delivery systems also indicates the status of their general health.

In examining the distribution of adverse outcomes, we explore the risk factors that may contribute. We monitor risk factors that occur during the mother's pregnancy such as hypertensive disorders, preeclampsia, anemia, breech position and placenta previa. Risk factors during delivery that are important to monitor include eclampsia, prolonged second stage of labor, premature rupture of the membranes, fetal distress, uterine inertia, transverse presentation, prolapsed cord and maternal shock.

We then measure the adverse outcomes arising in the infant, paying attention to low birthweight and infant, neonatal and perinatal mortality. The risk approach plots the distribution of risk factors leading to these outcomes. The risk factors generally include asphyxia, presentation, birth defects, fever, jaundice, injuries and cord problems.

We identify the major risk factors for the selected adverse outcomes using the following calculations:

1. The distribution (incidence rate) of risk factors for each adverse outcome.

2. The likelihood (relative risk) that the outcome would occur if the risk factor were present.

3. The impact of the risk factor within the population (population-attributable risk based on both the incidence rate and the relative risk).

The epidemiologic tools used in the risk approach are standard and can be used in many developing nations. They include rates, relative risk, attributable risk, sensitivity and specificity, tests of statistical significance (chi-square, t-test), tests of power and general surveillance techniques (data collection, tabulation, analysis, dissemination).

Analysis of the data can reveal whether perinatal mortality is truly a significant problem in comparison to other health problems such as maternal mortality, infant mortality or other. In itself, overall perinatal mortality is a relatively crude indicator. Many causes of mortality lead to the overall rate. We must therefore prioritize the most significant risk factors contributing to perinatal mortality. The indices of preventability and percent population attributable rate serve to pinpoint the most common and most serious factors. A review of the literature reveals which risk factors can be influenced through interventions. In so examining risk factors that have significant impact but are also preventable, we can focus on a handful of specific problems that can lead to a decrease in perinatal mortality.

Risk Screening System

The risk screening system, designed to predict which pregnancies are at high risk of resulting in perinatal mortality, identifies mothers who should be referred for high-level care. Once we identify the risk factors with the greatest impact on perinatal mortality, we begin to develop a system to screen pregnant women for the presence of those risk factors.

A sound screening system must provide reasonable and feasible answers to the following five questions:

Why is the screening being done?
Who will do the screening?
When will the screening be done?
Where will the screening be done?
What technology will be used in the screening?

Some pregnant women will have no risk factors, some will have two, and others may have several. Thus, some weighting must be provided for scoring the risk level of women. Quantifying the risk for each woman is not simply obtained by adding the number of risk factors present. Each risk factor poses a different degree of risk of the adverse outcome. We assign an estimated relative risk, therefore, to each of the risk factors. The health care workers assess each woman for the presence of risk factors, find the weighted value of each risk factor present, and add them together to find the total risk score.

How does the new screening system perform? Over time, has the systems predicted 60%, 70% or 75% of mothers who delivered babies suffering morbidity or mortality? How efficient was the system? Obviously, a system is inefficient if it mislabels 40% of healthy babies as being at high risk. A reasonable risk screening system must establish as a cut off a risk level that captures as many of the high-risk women as possible without overwhelming the resources of the health care delivery system.

ASSESSING PERFORMANCE

The matching of resources to needs is a critical component of the risk approach. Our goal is to determine how well the health care delivery system could function in reducing the risk factors and outcomes identified in our surveillance. Could the system support the changes required? Further, could we locate areas where resources must be reallocated, especially considering that reallocation of existing resources, rather than incorporation of new resources, was a key factor in the program.

Once we have identified the priority risk factors, we have a clearer idea of what should be done to reduce the health problems. The first questions to ask is "what are the current practices for reducing the health problems?" By assessing what is actually being done, we could identify the performance problems in the health care system and begin to correct those problems. A problem in the health care delivery system exists when there is a difference between "what should be done" and "what is being done."

Case reviews of perinatal and maternal mortality provide a qualitative assessment of performance. In reviewing each death, representatives from different levels of the health care system convene to answer the following questions:

1. What tasks should have been performed at each level?
2. Were the tasks performed?
3. Were the tasks performed correctly?

Through systematic enquiry, we examine the skill, knowledge, attitude and resources in all three levels of the health care delivery system: the individual and community level; the organized health care delivery system; and the intersectoral system.

For a more quantitative assessment, we survey the number of trained caregivers, the sites where care is provided and how many pregnant women and newborns receive care in each site, what percent of pregnant women receive prenatal care at given points in time, the number of times each method of delivery is performed and the outcomes, the number of postpartum visits attended, and the amount of resources allocated to maternal and child health and the various risk factors.

Health care problems generally fall into three categories (Figure 3). The first, lack of knowledge or skill to perform, arises from lack of information or education or training. The lack of information hampers the community if members do not know what is healthy behavior, how to recognize health problems, or where to turn for help. The health care system may fumble because of inability to recognize or handle health problems or the inappropriate assignment or selection of personnel. The intersectoral system may be unaware of the needs or of the obstacles imposed by the environmental and political decisions.

The second category, poor attitude, likewise can afflict all levels. Individuals at all levels may lack the desire to perform. It may be that performance results in punishment: a pregnant woman may be criticized for calling attention to her problems, a health care worker may end up working longer hours after recognizing a problem, or the intersectoral level may end up allocating more of its limited resources. It may be that performance is simply not rewarded. Or perhaps the performance simply does not matter.

The third category--resources--becomes problematic when resources are either not available or not properly organized and managed. Resources include manpower, money, materials and management systems. Geography, climate or politics may pose constraints.

DESIGNING A NEW STRATEGY

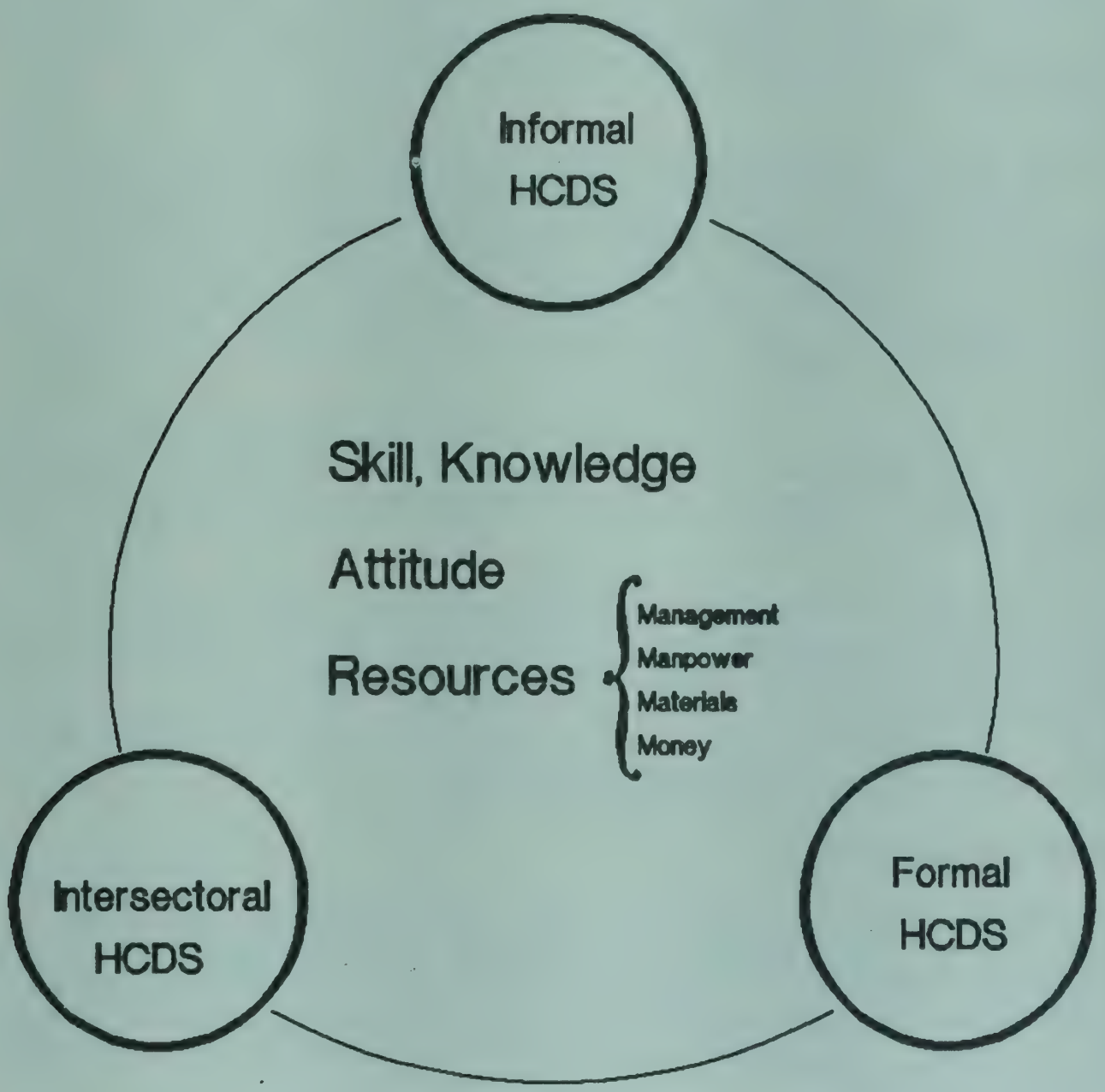
We set two goals for intervention: primary and secondary prevention. The goal for primary prevention is to modify the risk factors by preventing their occurrence. Through secondary prevention efforts, our goal is to prevent deaths associated with the presence of the risk factors.

Intervention strategies should:

- o include promotion, prevention, early detection, treatment and rehabilitation activities;
- o emphasize the use of appropriate technologies that are available and practical for application at the community level;
- o primarily use resources available within the community, region, province;
- o be flexible enough to accommodate different solutions reflecting local circumstances and conditions;
- o be compatible with government policies, regulations and directions;

Figure 3

Levels of the Health Care Delivery System (HCDS)



- o promote the extension of coverage to the total population with at least the eight essential elements of primary care services;
- o promote coordination among various government sectors and non-governmental organizations in the planning and delivery of primary health care;
- o promote community involvement in decision making and in the implementation of country-wide programs;
- o benefit the largest possible number of socially vulnerable population groups, including the rural population in particular.

The risk approach requires intervention strategies that encompass all three levels of the health care system: individual and community; the organized health care delivery system; and the intersectoral system (Figure 4).

The individual and community levels provide the pivotal points for health education. Individuals must learn about health and disease in order to adopt healthy behaviors and to identify signs and symptoms that suggest health care is needed. Individuals and communities can successfully conduct a first-level of risk screening. Local communities can develop systems for noncritical, routine care.

At the level of the organized health care delivery system, we universally institute five strategies: (1) we increase coverage through an improved risk screening tool; (2) we improve referral with a better match of provider skills to patient risks; (3) we modify risk factors through both primary and secondary prevention to prevent health problems; (4) we increase provider skill through training and user skill through education; and (5) we enhance facilities through provision of treatment resources.

Finally, the intersectoral level would be reorganized and made capable of supporting the risk approach. Thus the resources provided by the intersectoral policies would better reflect the distribution of need and risk factors among the population.

Finally, implementing intervention strategies aimed at improving perinatal care requires appropriate technology, staff, facilities, and procedures. We analyze the constraints imposed by the health care delivery system that might present obstacles to performing the intervention strategies. The obstacles, ideally, are overcome. In some cases, however, the obstacles are not surmountable and thus force a modification in intervention design.

EVALUATING THE NEW STRATEGY

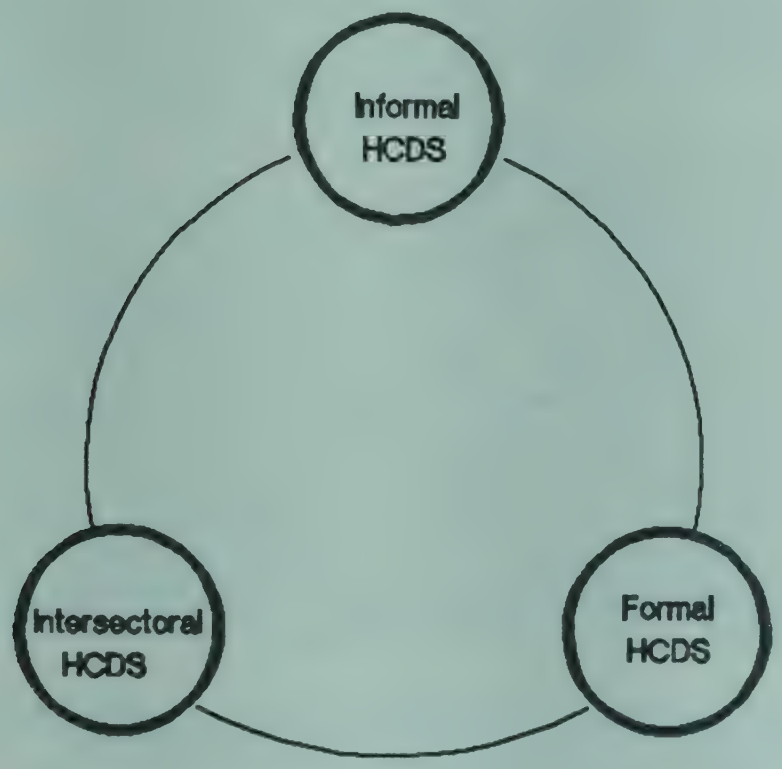
With the strategies and tasks under way, our next responsibility is to determine whether we are investing our resources in strategies that really work. We seek to determine whether we achieved our objectives of decreasing the perinatal mortality rate, modifying major risk factors, and improving performance problems. Evaluation cannot take place without a predetermined set of measurable objectives.

We measure five sets of indices to evaluate the effects of interventions.

1. In detecting any improvement in outcome, we measure changes in the perinatal mortality rate for specified risk factors. For example,

Figure 4

Uses of the Risk Approach in Different Levels of the Health Care Delvery System



1. Individual and Family Care

   Screening for Risk

   Health Education

2. Local Community Care

   Development of local care

3. Increasing Coverage

   Screening for Risk increases coverage

4. Improving Referral

   Match need with skill

5. Modifying Risk Factors

   Applying known & effective interventions

6. Local reorganization & training

   Changing skills and facilities to match need

7. Regional & National Reorganization and Training

   Applying known & effective interventions

8. Intersectoral Policy

   Reflects the distribution of resources to match need and population risk

perinatal mortality may have been reduced among mothers who present with hypertension during pregnancy.

2. To detect any improvement in the process indicators, we determine whether the health care system is functioning vertically. For example, are greater percentages of high-risk women cared for at more appropriate levels of the organized health care delivery system?

3. Improvement in the use of appropriate technology may pivot on whether a selected technology, such as hemoglobinometers, is increasingly available.

4. Improvement in staff training is reflected in the decisions and actions of the health care workers. A key measure, for example, would be whether nurses or midwives recognized and acted upon risk factors present in pregnant women.

5. Finally, an improvement in the level of knowledge in the community might be assessed by questioning whether more pregnant women alerted health care providers to the appearance of a risk factor, such as swollen ankles.

SHUNYI, CHINA EXPERIENCE

Process of the Risk Approach in Shunyi County, People's Republic of China

The Shunyi Risk Approach Project in Perinatal Health began in 1983 after an initial preparatory phase indicated that the risk approach would be a functional tool for China. Shunyi Country was selected as a model county in which to gain experience before expanding the risk approach throughout China. The responsibility for this model project was shared by a collaborating group consisting of the Beijing Medical University, the People's Liberation Army General Hospital, the Beijing Military Hospital, the Navy Hospital, the Air Force Hospital, the Beijing Municipal Maternal Health Institute, the Shunyi County Hospital, and the Shunyi Maternal and Child Health Station.

Before implementing the risk approach, we established an evaluation system for perinatal care and surveillance. During this preparatory phase, seven townships were randomly selected for the risk approach pilot study. In addition, a pilot study was conducted to develop a smoothly operating data collection system. We experienced an initial loss-to-follow-up rate of 30% but by revamping our system we were able to follow more than 95% of the pregnant mothers in Shunyi county. During this phase, we also established a referral system based on the three levels of health care: the village health station, the township hospital, and the county hospital. Six primary tasks were emphasized: prenatal screening, registration, risk assessment, treatment of abnormal or high-risk cases, referral to appropriate levels of care, and postpartum follow-up of complications.

The project officially began in August 1983. From October 1983 to September 1984, data were collected and analyzed on a cohort of 1,914 pregnant women and their 1,928 infants. At the same time that surveillance began, we assessed the performance of the health care delivery system by reviewing 50 cases of perinatal mortality. A quantitative assessment was made of health care coverage, including the number of prenatal visits made by pregnant women, the site of delivery and the mode of delivery.

We analyzed the data and identified the major health problems by the end of 1984. The intervention strategies for reducing the health problems were planned and then, in 1985, implemented. In 1987 we evaluated the effectiveness of the strategies on the basis of data collected during the intervention years.

Identification of Health Problems

Analysis of the initial data collection indicated that the perinatal mortality rate was 25.9/1,000. This rate was nearly six times greater (relative risk of 5.8) than the perinatal mortality rate in a comparison group in Georgia, U.S.A. Our epidemiologic investigations identified five risk factors that had the greatest impact on perinatal survival: neural tube defects, asphyxia, hypertensive disorders of pregnancy, breech presentation, and low birthweight.

The investigation also allowed us to develop a screening system for high-risk pregnancies. Each mother was assessed for the presence of medical and obstetrical risk factors three times during her pregnancy (during the initial prenatal visit, at 28 to 36 weeks' gestation and at 37 weeks' gestation or greater). Her score was determined by adding the relative risks for each of 12 different risk factors present.

Assessing Performance Problems within the Health Care System

In tandem with our investigation of health problems and risk factors, we assessed the performance within the health care delivery system. Individuals and families exhibited poor knowledge of the basic signs and symptoms associated with pregnancy complications. Further, most women were not aware that they should begin their prenatal exams before 12 weeks' gestation. Care givers in the organized health care delivery system lacked skill in treating high-risk pregnancies, used poor clinic scheduling that could not meet the needs of emergency patients, and provided no educational program for patients. In addition, the intersectoral level posed obstacles because of a poor transportation system and ineffective telephone service.

Planning and Implementing Intervention Strategies

Our intervention strategies focused on modifying risk factors and improving performance. We launched a massive public education problem to teach pregnant women and their families about prenatal care and when to seek help for potential complications. Practitioners at each level of the health care delivery system learned how to assess risk and make appropriate referrals. The village doctors were given the skills, resources, and motivation to conduct prenatal examinations, and the township hospital staff were trained in managing complications of pregnancy. Finally, the county hospital staff increased their skills in neonatal care and in the management of the more serious complications of pregnancy and delivery.

Our targets were to decrease perinatal mortality attributable to low birthweight from 5.4% to 4.2%, birth defects from 1.6% to 1.3%, asphyxia from 4.7% to 3.5%, pre-eclampsia and eclampsia from 1.4% to 1%, and breech presentation from 4% to 3%. Overall, we sought to decrease the perinatal mortality rate from 26/1,000 to 22/1,000.

Evaluation of the Intervention

The intervention strategies, for the most part, exceeded our targeted objectives. Our evaluations were based on prospective, continuous before-after comparisons, our ongoing surveillance system, and selected indices of improvement in outcome, risk factors and process. The perinatal mortality rate reached the target of 22 deaths per 1,000 births by 1985. By 1986, it was substantially lower at 17/1,000 and represented a 34% reduction over two years.

The targeted objectives for reducing perinatal mortality attributed to risk factors were also achieved. Our results included the following:

- o Complete reduction of eclampsia (0 cases)
- o 90% reduction in pre-eclampsia (1.7% to 0.1%)
- o 84% reduction in asphyxia (4.7% to 0.8%)
- o 50% reduction in birth defects (15.6% to 7.7%)
- o 10% reduction in breech presentation (4.1% to 3.6%)
- o 10% reduction in low birthweight (5.0% to 4.2%)

In addition the percentage of women who attended their first prenatal visit before 12 weeks' gestation increased from 36.3% to 59.1%. The percentage of infants with breech presentations who were delivered at home decreased from 14.3% to 5.7%.

CONCLUSIONS

The risk approach is both functional and effective. Experience has shown that the risk approach does, indeed, lead to lower rates of perinatal mortality, without taxing current health care systems. Moreover, the risk approach can be conducted in regions with limited expertise. We are now considering avenues for simplifying the system further by relying only on calculations such as cross tabulations, simple frequencies, relative risks and population-attributable risks.

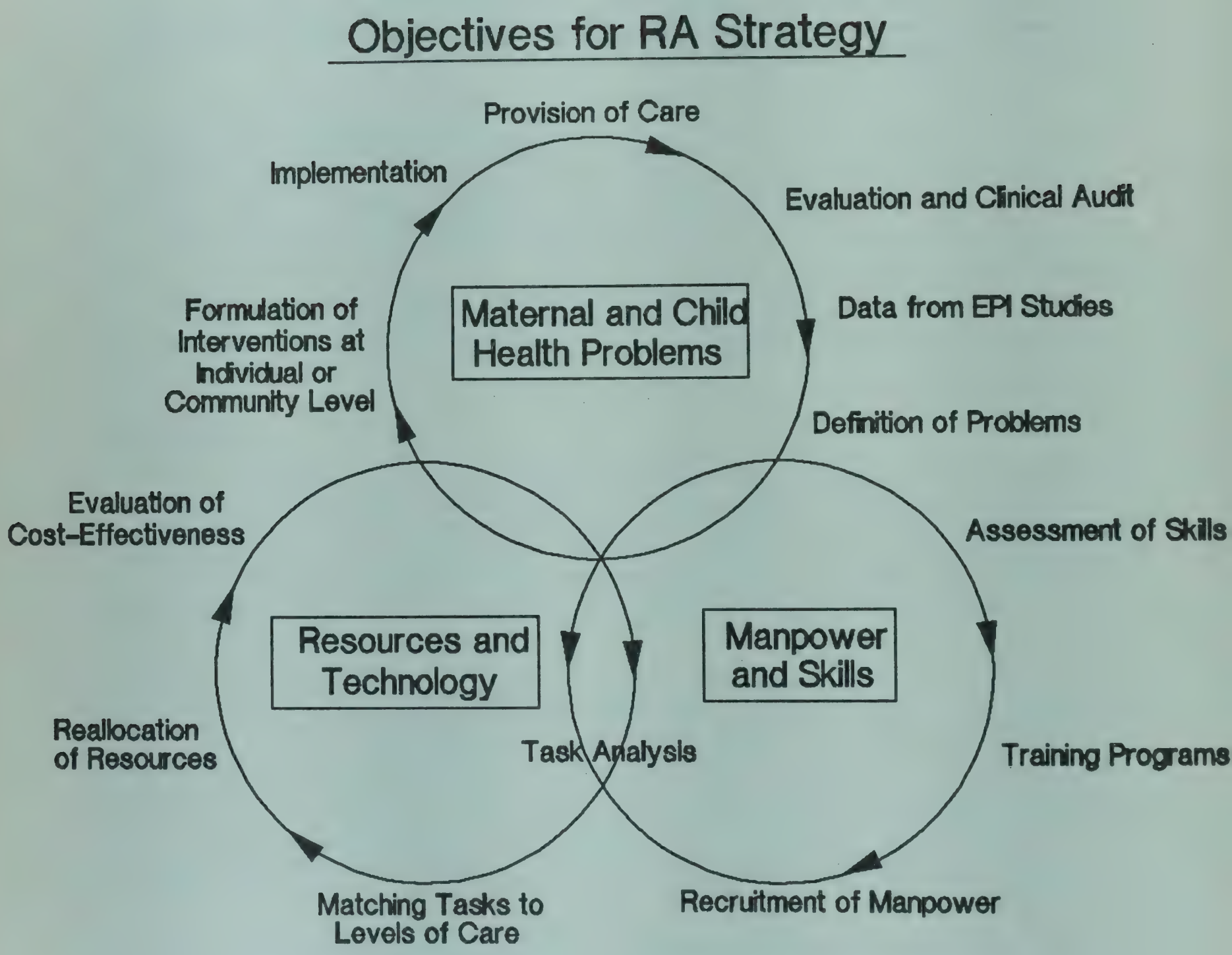
Although in Shunyi County, China, we chose to conduct the risk approach over a period of five years, we do not feel that this length of time is an absolute requirement. The establishment of a perinatal health care service and a surveillance system requires one year. One cycle of data collection, analysis, implementation of intervention strategies, and evaluation requires three years. Based on our experience, we can conclude that four years if probably an optimal period over which to carry out the methodology. This time period can be further shortened in areas that have existing systems for perinatal care and surveillance.

In the pilot study in Shunyi County, the perinatal mortality rate was reduced to an even greater degree than we had anticipated. The risk factors associated with perinatal mortality, especially hypertensive disorders of pregnancy and asphyxia were, for the most part, successfully modified. Our success provides strong evidence that the risk approach is an appropriate tool for China, including the rural regions. Over a three-year period (1985-1987), we conducted three national workshops in which we trained more than 300 representatives from 29 provinces. Seven projects have resulted. As we continue to train personnel, we will simplify the methodology so that it can be performed independently at the county level. We are now planning to develop

additional training and to install a computerized Management Information System. Our future plans include expanding the risk approach to 10 provinces by 1990 and to all provinces by 2000.

The risk approach takes a wholistic exploration of the health care system and installs wholistic strategies. As we in public health care have learned, improved health requires cyclical contribution from all aspects of the health care system (Figure 5). In the future, the risk approach will not be limited to perinatal health but will be applied to the broader field of maternal and child health. Eventually it will be applied to the management of all health resources and public health efforts.

Figure 5


Objectives for RA Strategy
Provision of Care
Implementation
Evaluation and Clinical Audit
Formulation of Interventions at Individual or Community Level
Maternal and Child Health Problems
Data from EPI Studies
Definition of Problems
Evaluation of Cost-Effectiveness
Assessment of Skills
Resources and Technology
Manpower and Skills
Reallocation of Resources
Task Analysis
Training Programs
Matching Tasks to Levels of Care
Recruitment of Manpower

RISK APPROACH TO MATERNAL AND CHILD HEALTH CARE

Participating Centres:

Ahmedabad - B.J. Medical College
Chandigarh - Postgraduate Institute for Medical Education & Research
Delhi - University College of Medical Sciences
Jaipur - Indian Institute of Health and Management Research
Gwalior - Gwalior Medical College
Lucknow - K.G. Medical College
Pune - KEM Hospital
Varanasi - Banaras Hindu University

Coordinating Centre : N.C. Saxena, K.K. Singh, K. Maitra
Overall Coordinators : Dr. B.N. Saxena
Presenter: K. Maitra

The continuing high perinatal and maternal mortality and morbidity in most developing countries need to be reduced within the existing framework of Health for All by the Year 2000 AD through strengthening of the primary health care elements.

To accomplish this, several realistic approaches which are likely to be acceptable to the people, suitable for the local conditions and affordable need to be introduced. These include good quality antenatal care, adoption of the risk approach, promotion of self care, presence of a trained birth attendant, etc.

Among these, the risk approach is a managerial tool to improve resource utilization in health care. It is particularly suited to maternal and child health and family planning care, where promotive and preventive activities and early health care action are needed.

Infants and children under six years of age and married eligible women in our community constitute about 57% of the population. It is, therefore, necessary with our meager resources to identify particularly those at risk and provide them with efficient MCH services; because it is this at-risk population that contribute largely to perinatal, neonatal, infant and maternal mortality rates.

In this context, the Indian Council of Medical Research has completed a study on the identification of high risk families, mothers and outcome of their offspring with particular reference to the problem of maternal nutrition, low birth weight, perinatal and infant morbidity and mortality in rural and urban slum communities.

The objectives of this study were to:

(1) Identify the families at greater risk from health and nutritional point of view from data on nutritional status, morbidity and mortality of mothers and children.

(2) Identify high risk pregnant women and newborns in these families by using at risk approach.

(3) Obtain data on incidence, etiology and outcome of low birth weight infants in these families, and

(4) Obtain information on utilization of available MCH facilities during prenatal, natal and infancy period.

Women were identified for pregnancy through their LMP monitoring and were registered as well as followed up until delivery. Their offsprings were also followed for a period of one year.

TABLE 1

SUMMARY OF PREGNANCY OUTCOME

Total Pregnancies	:	7313
	:	4261 (Rural)
	:	3052 (Urban Slums)
Abortions	:	5.4%
Still Births	:	2.6%
Live Births	:	92%
Perinatal Mortality Rate	:	57.7/1000 Live Births
	:	Rural 61.8 and 52.0 Urban Slums
Neonatal Mortality Rate	:	50.9/1000 Live Births
	:	Rural 58.4 and 33.8 Urban Slums
Infant Mortality Rate	:	52-120/1000 Live Births
Low Birth Weight	:	33-41% (Rural)
$\leq$ 2500 gm.	:	27.1 56% (Urban Slums)

A total of 7313 pregnancies were recorded in this study. Among these, 4261 were rural and 3052 were from urban slums. Each pregnancy was expected to be followed up at least five times at the specified period of 16, 20, 20-30, 34, and 38 weeks. The antenatal check up showed interesting urban and rural differences. In rural areas only 1.5% women had all the antenatal follow up, whereas in urban areas 15.6% had all five contacts.

It was found that 26.5% of the deliveries were conducted by doctors, 19.2% by trained nurses, 16.8% by trained dais and 37.5% by untrained dais or relatives. As expected, rural and urban areas recorded sharp differences. Doctors conducted only 6.9% deliveries in rural areas as against 39.8% in urban areas.

Out of the total pregnancies, 92% of the pregnancies terminated in live births, 5.4% in abortions and 2.6% were still births. The total number of abortions were very low in this study. In pregnant women registering for

prenatal care in the first trimester, the expected rate of early fetal loss (abortions) is about 10-20%.

The overall perinatal mortality rate was 57.7 per 1000 live births. The rural PNMR was higher at 61.8 as against 52.0 per 1000 live births for urban centres.

The neonatal mortality was 50.9/1000 live births. It was significantly higher for rural areas (58.4) in comparison with urban slums (33.8). The inverse relationship of birth weight and gestation to neonatal mortality is well reported in several studies and the same has been observed in the present study.

The infant mortality in this study ranged from 52 to 120.6 per 1000 live births. The prevalence of low birth weight infants ranged from 27%-56% in urban slum and 31-41% in rural areas.

In this study the risk factors which had direct relationship with the outcome were as follows:

	Outcome
- Illiteracy	
- Birth Interval < 24 months	
- Previous Still Birth	
- Previous Preterm	> - Perinatal Mortality
- Untrained Birth Attendant	
- Birth Weight < 2000 gms.	

- Illiteracy	
- Birth Interval < 24 months	
- Previous Preterm	
- Untrained Birth Attendant	
- Congenital Malformation	> - Neonatal Mortality
- Poor Feeding	
- Birth Weight < 2000 grms.	

In case of low birth weight, factors such as illiteracy, age of mother 19 years, primi parity, maternal height < 145 Cms, maternal weight < 40 Kg, maternal haemoglobin < 8 Gms, gestation < 36 weeks, and birth interval less than 2 years had direct relationship with the outcome of low birth weight, i.e. $\leq$ 2500 grms.

Thus this study identified the risk factors related to the adverse outcome of pregnancy.

Taking into consideration, the above findings the Council launched a multicenter study at 8 centres of the country with the risk approach concept.

The causes of maternal mortality, perinatal mortality and infant mortality have been very well documented. It would therefore be necessary to evolve appropriate intervention, to decentralize responsibilities, to mobilize local human resources and to arrange for a flow of referral so that MCH care provided at the primary care level is sufficiently strengthened and re-organized.

The present ongoing study on comprehensive MCH care is an action oriented study which commenced with the reorientation of the existing staff in the health care delivery system towards adopting the high risk approach in maternal and child health care.

An essential component of this study is involvement of the community for monitoring the pregnancies, feeding timely information and supporting the existing health infrastructure in the provision of appropriate services. An effort is being made to provide intensive health education, to create awareness in the community and to bring about changes in attitude and behavior for utilizing the services meaningfully. This study also aims at developing a suitable referral mechanism taking into account the facilities available at different levels.

The objective of the study is to develop a package of interventions for improving maternal and child health care towards identification and management of high risk pregnant mothers and their offsprings utilizing the existing health infrastructure optimally with a view to replicate it as part of primary health care programme.

Specific Objectives:

1. To develop methodologies for identifying high risk pregnant women and at risk infants early and their management at different levels of health care and to improve coverage.

2. To train the team of existing health personnel.

3. To educate the community and mobilize the community resources.

4. To develop a suitable referral system.

5. To develop an in-built system of collecting health statistics relevant to the monitoring and evaluation of the programme.

TABLE 2

SITUATION ANALYSIS
(NO. OF PHS SURVEYED: 8)

	PHC
POPULATION	80,000-169,000
VILLAGES	35-144
SUB-CENTRES	12-44
NO. OF BENEFICIARIES PER UNIT HEALTH FACILITY	4,000-10,500
NO. OF BENEFICIARIES PER MEDICAL DOCTOR	20,000-42,500

Before planning for the actual intervention, it was considered appropriate to carry out in the first phase, a situation analysis of the primary health centres in which the study has been contemplated in order to have adequate information and insight about the availability and extent of utilization of resources, the working methodology and technical procedures in the existing system and perception of the community. Each centre has taken one PHC population ranging from 80,000-100,000 as its study area.

The results from the situation analysis showed that 50% of the villages were over 20 kms away from the PHC Headquarters and the population under its control was 80,000-169,000.

Medical officers were in position, but there was shortage of paramedical staff.

Lack of anaesthesia and baby resuscitation kit was found in all the centres.

As has been mentioned earlier, because of the distance of centres, it was difficult for many of the ANMs to work at their respective places. Timely repairs and maintenance of cold chain equipment was not ensured. The recording system of various statistics were found to be very poor. There were very few records available and they too were unsatisfactorily maintained.

It was observed that paramedicals have theoretical knowledge but little practical knowledge and experience and they do not utilize their own skills during delivery of MCH services.

It was also found that the community was not utilizing the services which were available to them, thus people involvement in the programme was poor.

The next phase of the study was the developmental phase. During this phase, the deficiencies identified at the primary health centres were strengthened.

- Procurement of equipments at the PHC and subcentre.
- Weighing machine for mother and baby.
- Hemoglobinometer
- Urostix, dai's kits, ORS packets, etc.
- Preparation of teaching manuals/aids according to the local needs of the community.

Baseline survey was done with the following objectives:

a. To find out the household information comprising family structure and socioeconomic condition.

b. To determine the denominators for calculations of pregnancy and vital rates.

c. To find out the level of mother and child health care and family planning acceptance.

d. To determine the characteristics of events like births and deaths.

The main component of the intervention consists of training of the health functionaries at the primary health centre, creating community awareness, to generate demand at the community level, to improve utilization of the existing MCH services and the development of a referral system.

Decentralization of targets for MCH and Family Planning forms an important component of this study. These eight study areas have been exempted from the usual penalization of non-fulfillment of family planning targets.

It has been increasingly realized and felt that delivery of MCH services today means family planning and in family planning it is the tubal sterilization which has utmost priority and the delivery of MCH services still remains to be very weak at PHC and subcentre.

As regards training, the initial training was imparted by the project investigators for a period of one week and later. On the job training is being carried out at the PHC and subcentre by the research officers of the team.

Training was given on different aspects of antenatal, intranatal and postnatal care. Emphasis was laid on identifying high risk pregnant mothers and infants as well as establishment of a three level referral system of these risk cases.

Community education forms an integral part of this study. Generation of awareness in the community is being tried out through focus group discussions and mahila mandals. For the success of the programme, it is very necessary that the community be mobilized and motivated to come forward to avail the existing MCH services.

As regards the recording system and improving the monitoring and evaluation of the programme, registers for registering pregnant women at the primary health centre and subcentre have been introduced.

Home based mothers and child card have been developed and distributed, and referral slips have been introduced in the project area.

The development of referral mechanism forms a very difficult and important component in this study.

After one year's intervention in these eight centres, a few of the findings are highlighted below:

To bring down the mortality rates is a hard task to be undertaken. Initially it is being seen whether there is any change in the underlying processes such as antenatal registration, identification of high risk mothers and infants, minimum services rendered to the registered mothers, and referral of risk cases.

It is being observed that average antenatal registration during the last one year of intervention is showing an increasing trend.

The risk factors taken into consideration such as gravida > 5, birth interval < 18 months, bad obstetric history which includes (previous still births, previous abortions, previous preterm), gravida 1 with age < 18 years,

gravida 1 with height ≤ 145 Cms, G I with age ≥ 35 years, G I with weight < 40 Kg., oedema, eclampsia, and Hb < 8 gm.

It is being observed that of 3485 women who were registered for delivery, in 60% of women none of the risk factors were present.

Various risk factors among the total 1430 women were observed. It was found that 31.7% women were gravid more than 5 times, in 17.1% birth interval was < 18 months, 15.9% women had a bad obstetric history, 9.2% were GI age < 18, 6.7% GI ht < 195 cm, 4.8% GI age > 35, 3.6% Hb < 8 gm and 11.% other.

In the training phase of the intervention period, the ANMs were taught how to carry out Hb estimation, urine examination, weight recording, injection of tetanus toxoid, use of safe delivery kits which has been supplied to the ANMs and birth weight recording of the infants born.

Among the services rendered to the registered women during 1988, it has been observed that the quality of services were very poor during the situation analysis phase and are seen to be picking up during the intervention phase. Weight is now being recorded in 60.9% women and in 65.9% women tetanus toxoid injection is being given. In addition blood examination was done in 37.9%, urinalysis in 39% and birth weight recorded in 55%.

Mechanism of referral through training, introduction of referral slips has not yet been established satisfactorily.

It has been thus felt that the establishment of maternal and child health programmes based on the risk approach requires an estimate of the importance of defined outcomes to the community, of the feasibility of detecting those at risk with local resources and of the acceptability of the intervention.

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LEAD DISCUSSION

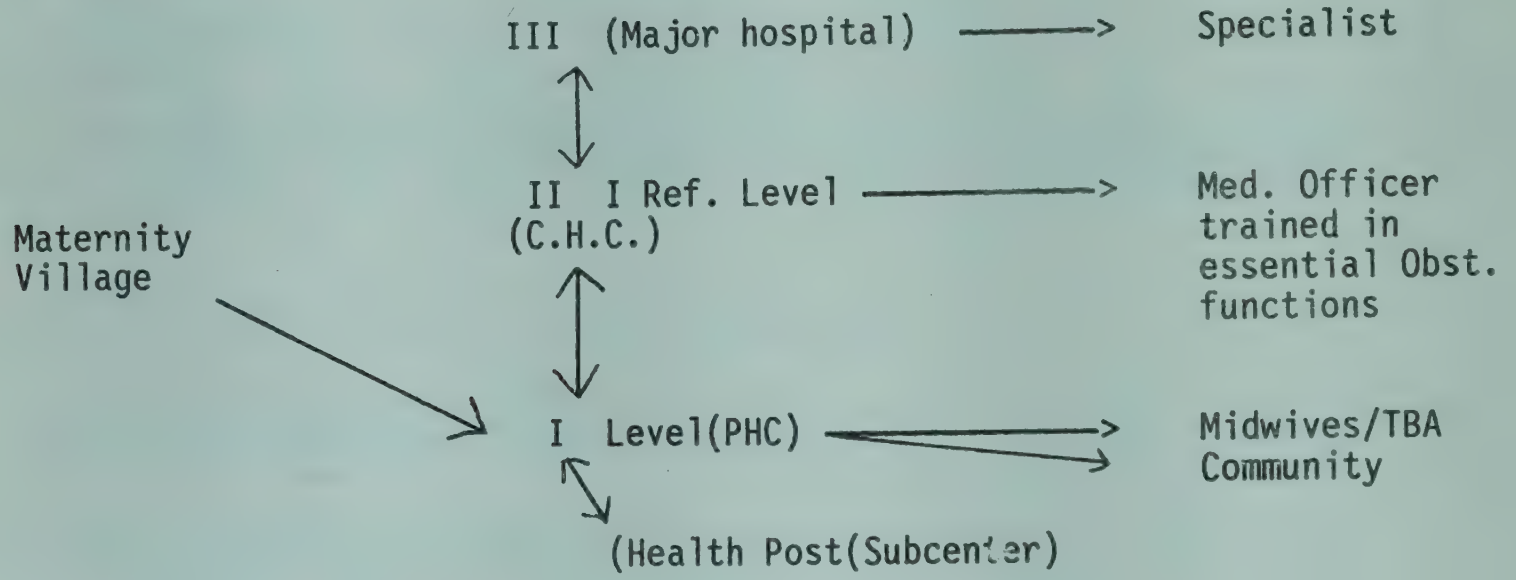
K. Bhasker Rao

The risk approach involves the optimal use of existing MCH services for all but special attention to those needing it most.

For this, the risk factors in a community have to be identified by epidemiological studies. These factors may vary from one country to another and even within different parts of a country. These may vary in number also from 15 to over 100. But for practical purposes 10-15 of the more relevant high risk factors which could be identified by the health worker in the field have to be considered. By a scoring system, they could be quantified. The scores may be graded from 0-2 for each factor depending on the risk involved. The total score determines whether a pregnancy is low, moderate or high risk. The high risk mother mostly carries a high risk baby. No one scoring system is perfect and needs modification after field trials. Even risk factors (or scores) may have to be modified.

Once a high risk case is identified, intervention is indicated depending on the type of risk factor and the level at which it could be managed.

A good referral system is crucial to the success of the risk approach to MCH care.



What types of cases (cut off points in the total score), where to, when and by whom the referrals could be done have to be spelled out. Any intelligent health worker or even a trained traditional birth attendant (TBA) could refer. It is better to have false positives than miss at-risk cases or delay emergencies. Feedback and periodic evaluation of the referral system is useful.

Sometimes a low risk case may prove to be a high risk one during labor requiring intervention or referral elsewhere. There must always be back up facilities available in the field for this.

Priorities in the risk approach are:

1) Health education is essential: Many at-risk cases go unnoticed as they do not avail themselves of MCH services. (In an ICMR study 1 out of 7 urban and 1 out of 4 rural cases had no perinatal care.) Through the use of the media, etc., every woman should be made aware that pregnancy is not always physiological and should be persuaded to seek health care by 12 weeks of gestation (and later at 28, 34 and 38 weeks) and also book for her delivery with a trained health worker following the screening. This booking has to be decided well before term. (In the same ICMR study, 90% of deliveries in rural areas were domiciliary and over 50% were looked after by untrained TBAs).

2) We should strengthen the grass-root levels (subcenters/PHCs) with more health workers (and less number of physicians). We need at least 1-3000 and these should be recruited locally so that they could stay, work and gain the confidence of the community including the TBAs. There is a gross shortage of midwives at present. Unless we train a large number, we will not be able to provide full antenatal (including risk covering) and intranatal coverage, immunization, growth monitoring of children and family planning (FP) advice.

3) There is an urgent need to reorganize the referral level (community health centers) and staff it with physicians trained in MCH and FP (not obstetrician) skilled in essential obstetric functions so as to manage high risk cases and emergencies with minimal delay.

4) Family planning and abortion services should be easily available to all women of reproductive age to prevent deaths due to sequelae of pregnancies. Immunization services to all pregnant women and children are needed to avoid neonatal tetanus and other infections in infancy and childhood.

RISK FACTORS

Universal factors		
	Age < 17 yrs	≥ 35 yrs
	Parity ≥ 5	
	Ht: ≤ 140 cm	Distance from PHC : > 10 K.M.
	Wt: ≤ 40 Kg	B. Interval : < 8/12
History:	B.O.H.	Habitual abortion : Repeat preterm del/SB
		Previous caesn; manual removal of placenta
Current Pregnancy:		Hb ≤ 8 g%
		Pre-eclampsia; eclampsia
		Malpresentations; CPD, twins; APH
MCH fac.		No prenatal care
		Duration of labor >18 hrs : 1 > 24 hrs: 2
		Liquor draining: 1
Baby		< 2.5 kg - 1 asphyxia : 1 congenital malf. 1

Appropriate Technology for Maternal and Infant Care

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In earlier years, and even to the present time, the concentration of international efforts directed toward reducing infant mortality have been on diarrheal diseases with oral rehydration as a major therapeutic maneuver, diseases which for immunization is the major therapeutic intervention and malnutrition with a concentration on establishing and maintaining breast feeding. Oral hydration, immunizations and breast feeding have had a major impact on infant mortality. However, even with these programs infant mortality rates in countries with excessively high rates may range from 30 to 200 deaths/1000 live births.[1]

Recently, many international health agencies have begun to recognize that approximately half of all infants' deaths (42-63%) are actually neonatal deaths with most of these occurring in the first week. If anything, the neonatal mortality rate actually may be higher than reported because in many countries an infant's death is not reported until the infant has lived for at least 1 week or in some instances a month. Stillbirths are not reported at all.[2] Thus a country which wants to make a significant impact on reducing infant mortality must incorporate health initiatives that deal with the perinatal determinants of maternal and neonatal health in addition to programs which relate only to child survival. Before describing a package of intervention strategies, the following general principles in MCH planning need to be emphasized:

- Deaths to infants in the first month of life especially in the first week of life are primarily related to the health and nutrition of the mother and to the circumstances surrounding the infant's birth.

- In a region where there is a high neonatal/perinatal mortality rate, the maternal mortality rate and the incidence of childhood disability are also high. Intervention strategies to reduce neonatal/perinatal mortality also have a beneficial effect on the other two very vital health indicators.

- Correction of the problems leading to neonatal-perinatal deaths along with maternal deaths and childhood developmental disabilities, requires a more complex health care infrastructure than that required to deal with the problems leading to death in older children.

- Health planning should be done on as small a geopolitical unit (operational unit of a country) as is appropriate to a country.

Given these general principles in MCH planning, a package is proposed containing six intervention strategies directed at the perinatal determinants of maternal and neonatal health. This package of intervention strategies was derived from the cumulative experiences of persons who comprise the WHO Collaborating Center in Perinatal Care and Health Services Research in

Maternal Child Health in Atlanta. These recommendations should be used to build on health initiatives and successes already in place. As can be seen, this package has short, medium and long term intervention strategies.

(1) Modify and strengthen existing health information systems (HIS):[3,4] An optimally functioning HIS is absolutely essential when a government is trying to define its problems in maternal child health, to propose effective intervention strategies, and to monitor and review the results in a simple and timely fashion. Specifically, an HIS, in the form of the Risk Approach, is absolutely essential in the proper use and future allocation of limited financial and health manpower resources for maternal infant health. The purpose of the Risk Approach is to ask two simple questions--"Are we doing the right things?" and "Are we doing things right?"

(2) Immunize women with tetanus toxoid:[5,6,7,8,9] This intervention strategy may reduce infant mortality by more than any other single strategy. In some countries, this strategy may reduce infant mortality by as much as 25%. The specific reduction in infant mortality would relate obviously to the number of neonatal deaths caused by tetanus. It may also have a significant impact on maternal mortality if there is a low number of women between 14 and 45 who have not been immunized. If an immunization program for child survival is launched already, women's immunization could be done in conjunction with the child program but in three phases:

    (a) all pregnant women - third trimester
    (b) all married women
    (c) all other women between the ages of 14-45.

(3) Train traditional birth attendants (TBA): This intervention strategy, when coupled with a continuous inservice/supervision, stands as an optimum way to initiate risk assessment of the pregnancy and provide the appropriate level of prenatal care and improved birth/delivery practices.

Specific topics during the training program would include: simple ways of identifying the pregnancy to be high risk, tetanus toxoid immunization, utilization of iron/folate during the last trimester, monitoring growth of the fetus and the nutritional status of the mother, determining the position of the fetus prior to labor, instruction on clean delivery practices, initiation of infant respirations, keeping the infant warm, and placing the infant to breast immediately after birth.

The first intervention strategy in this area would be to initiate a survey of the current practices and local community acceptance of the TBA's who are already practicing. From the survey, a refinement and redesign of TBA training can be organized to interface best with local practices and needs. In addition, it is absolutely essential to organize a community program which encourages the utilization of the TBA within the organized health care system.

(4) Incorporate family planning in the Maternal Child Health Program:[10,11,12,13] This technology when incorporated as an integral part of an MCH program and when significantly used in a population can be associated with a reduced number of infant and maternal deaths. The first association is related to the potential creation of lowered fertility. In a country which does not have the medical and/or intersectoral infrastructure to deal with infant mortality secondary to adverse environment and disease, a lowered fertility would be associated with a decrease in the actual number of deaths simply because there would be fewer births. Similarly there can be a reduced maternal mortality from associated conditions of child birth (infection, hemorrhage, obstructed labor and pregnancy-induced hypertension) when a woman can control her fertility.

The second association is related to improved spacing of births. When there is an interval of greater than two years between births, infant and neonatal mortality has been noted to be reduced by half.

(5) Define and strengthen the referral and support services of the health care system:[14] Primary, secondary and tertiary levels of care should be defined by tasks, appropriate facilities, equipment, and personnel (both number and level of training required). Interdigitation of the levels is invaluable as a structure on which current care and planning can be implemented. This should take the form of published guidelines for perinatal care, specific for India, and should have an incorporation of both preventive and curative health care. In writing these guidelines, the concepts described in the RISK APPROACH could be very valuable. Even though the manual of guidelines for perinatal care is not meant to be a textbook, the development of patient protocols for management of selected recurrent disease may strengthen patient care and the performance and planning of those working in a regional maternal and infant health program.

(6) Promote public health and epidemiological education: A new generation of leaders in epidemiology and public health can have a major impact on improving the quality of health for a region. Three simultaneous programs could have a major long range impact:

(a) the creation of a country specific training program for pediatricians and obstetricians in the Risk Approach who will be taking posts at the district hospital level. These trained physicians would then function in both the preventive and curative roles when managing general medical officers, midwives, and lady health visitors dealing with maternal and child health.

(b) the utilization of training fellowships for public health epidemiologic study abroad.

(c) the creation of schools of public health in India.

Ways of stimulating interest in physicians to accept public health posts within the government will be essential in future planning and growth.

The international data concerning maternal and infant mortality reflect the urgency of our work. In the two days of our conference, there will be (the equivalent of) 12 jumbo jets of women who die from disorders related to child birth and in the hour of my talk there will be approximately 17,000 infants who die.

In the U.S. and in India, two countries which are interested in nuclear weapons and satellites, the technology also exists today to reduce both maternal and infant mortality. Our role is to convince both the "political and social wills" that this is of equal urgency.

In the Surgeon General's Conference on Maternal and Infant Health in 1980, Dr. Julius Richmond read a poem which so poignantly reminds us of the urgency of our work as part of the global family. The poem was written by Gabriela Mistral, a Chilean poet who received the Nobel Prize for Literature. "The child cannot wait. Many things we need can wait, but he cannot...To him we cannot say 'tomorrow', his name is 'today'.

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LEAD DISCUSSION

C. S. DAWN

Appropriate technology for maternal and infant care is defined technology which must be:

1. Affordable by community
2. Simple and indigenously available and meeting minimum need
3. Implementable in the community
4. Promote self care by the community
5. Acceptable by the community
6. Single technology package can be used for peoples education and service
7. Package of technology can be easily used to train health workers in maternal and infant care.

Appropriate Technology has the following components:

A. Maternal antenatal care

B. Delivery care

C. Postdelivery care.

A. Maternal Antenatal Care needs the following appropriate technology:

1. Registration of pregnant women for antenatal care at early pregnancy through clinical parameters-booking. Women should have at a minimum 5 checkups and optimum 10 checkups throughout pregnancy by trained health care provider - first at early pregnancy, at 20 weeks, 30 weeks, 36 weeks and at 38 weeks (minimum 5 checkups). At each checkup the following should be the minimal workup.

a. Education to pregnant women, her husband, and relations about need for antenatal checkup for her safety and that of her unborn child. She and her relations are educated on primary health care, adequate home resource, food to grow her health and her child, clean drinking water, mother and infant immunization, contraception for 1-2 child families and oral rehydration therapy (home made) for mild diarrhea in her child.

2. Physical checkup

1. Maternal height measured from wall painted height scale. In first checkup women below 145 cm in height are referred to specialist centre.

2. Regular record of weight from standard weighing machine at each

checkup. Aim is to get 10 kg weight gain during pregnancy. Daytime rest is recommended for weight promotion.

3. Regular blood pressure recording to identify women developing increase in BP to and above 149/90 mm Hg for referral.

4. Foetal growth in utero by regular checkup of uterine fundus by hand or symphysis-fundus by tape measure and Dawn foetal weight measurement during last three months of pregnancy. Women showing lower foetal growth (less than 4 weeks growth deficit) are referred to specialist centre).

At first checkup any woman showing the following high risks is referred to specialist centre.

1. High blood pressure at and above 140/90 mm.

2. All moderately anaemic women.

3. Bad obstetric history.

4. All primigravida are referred to PHC for doctor's care.

5. Women needing MTP is referred to MTP centre by 10 weeks pregnancy.

All MCH clinic should have Dawns Rule of ten Calendar for people education and service. Pictorial book with Dawns Rule of ten messages is to be shown to illiterate women by health worker.

Haemoglobin estimation has to be done at first checkup to screen women below <8 gm% for referral. Urine is examined for protein and sugar. Tab, iron folic acid. One tablet daily through pregnancy.

6. Two doses of tetanus toxoid at 20 weeks and 24 weeks by disposable syringe for safety of women and her unborn child against death from tetanus.

7. Delivery at clean delivery room by trained birth attendant with the help of disposable delivery kit.

8. The baby's mouth and throat should be cleaned. Baby born with asphyxia is to be revived by referral to specialist centre. Any woman with hemorrhage will be referred to Community Health Centre for blood transfusion. The help of Ambu Bag. Baby is to be provided with warmth putting baby immediately on mother's breast to avoid hypothermia. All babies at high risk are referred. Clean environment for the baby is stressed.

9. Promotion of breastfeeding practice for a minimum period of 10 months. Postdelivery care within 10 weeks of delivery. Provide contraception for spacing after first child and offer surgical contraception postpartum to couple (Tubectomy and Vasectomy) with two living children who are fully immunized.

10. Universal infant immunization for six killer diseases - Injecting BCG, within 2 months, OPV on 3, 4, 5th month, DPT on 3, 4, 5th month and measles vaccination by 1 year.

All MCH care providers are to practice this minimum appropriate technology from Level III to Level I.

Training of all MCH care providers about appropriate technology.

3. Community education through interpersonal communication by health workers. Make sure messages are appropriate for safety of women and baby.

4. Early risk approach referral from Level I to Level II or level III by checklist should be important component of maternal and infant care. Checklist with clear cut priority of risk conditions for mother and infant are to be fixed on the wall of Level I health units for early referral.

All the above minimum requirements are to be made available for training and services.

Training of Health Functionaries as Interventions for Improving Delivery of Family Welfare Services.*

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Primary Health Centres (PHC), each covering about 100,000 population in roughly 100 villages, are the basic unit for delivery of health services in rural areas in India. Within a primary health center, there is one subcentre for every 5000 population which is staffed by one male and one female health worker (the multi-purpose workers).

Besides the government health functionaries working in PHC and subcentres, one TBA (traditional birth attendant) and one VHG (village health volunteer/guide) has also been trained by the government in every village to extend the primary health care delivery to grass root level. During the last Five Year Plan, the government upgraded one out of every four PHCs to community health centres where services of specialists in internal medicine, surgery, obstetric and gynecology, and pediatrics are available. Thus, the country has seen tremendous infrastructural expansion of rural health services in the last three decades.

Within the health sector family welfare, which integrates maternal and child health services and family planning, has been accorded high priority. Besides the general health programmes aimed at mothers and children, a number of special programmes at the national level have been initiated. These include Universal Immunization Programs for vaccine preventable diseases, vitamin A prophylaxis for prevention of childhood blindness, diarrhoeal disease control by ORT, prevention of anaemia by iron-folic acid supplementation, integrated child development services, etc.

In spite of rapid expansion of health services and launching of several specialized programmes, the health status of mothers and children has not changed appreciably. The infant mortality rate is still 95 per 1000 live births, child mortality among under fives 25 per 1000 and couple protection rate below 40 percent.

Several reasons for this unsatisfactory state of affairs have been identified by the research workers working in the field of MCH and family planning. To mention just a few: the outreach of health care is confined to 3-5 km around the PHC (1,2,3), antenatal registration seldom exceeds 25% (3,4,5,6,7,8), registrations are delayed leaving not enough time for risk detection and intervention (3,5,8), quality of care is poor as important procedures like examination for detection of anaemia or toxaemia of pregnancy and maternal immunization against tetanus are not carried out (5,6,7,8). Lack of community awareness about the need and/or existence of MCH and FP services is yet another factor which has inhibited demand generation and utilization of

the PHC services (10). Studies conducted by Human Reproductive Research Centres (HRRC) under ICMR in more than 200 PHCs recently have confirmed once again many of these findings (12).

Effectiveness of health services is a function of coverage and quality of care. A simple model for improving the effectiveness of family welfare services (a combined package of maternal and child health and family planning) could be as follows:

	Providers of FW Services	Process	Receiver of FW Services
Intervention:	Improve knowledge & skill of health functionaries	Improve processes, i.e., supplies, procedures monitoring, etc.	Improve demand generation and demand pull by IEC

Results of a study to improve delivery of MCH services through training of MCH staff are reported here.

Objective of the study:

The objective of the study was to assess the effect of short-term in-service training of Health Worker Female (HWF) on the quality and coverage of maternal and child health services

Study design:

The study was conducted in three PHCs of Varanasi district assigned to the Institute of Medical Sciences, Banaras Hindu University under the ROME program.

The subject of this intervention study were HWFs who are actually responsible for delivery of MCH services at PHC and subcentre level. Twelve HWFs, four from each PHC, were selected by simple random sample. Another twelve HWFs were selected randomly as a control group.

The three phases of the study were as follows:

1. Diagnostic phase - under this phase the following measurements were made:

    1.1. Knowledge of HWF about specified components of MCH by administering a questionnaire.

1.2 Quantitative assessment of work performance by means of item analysis of antenatal, infant care, immunization and MCH referral records maintained by HWF. Records of six month period were analyzed for the purpose.

1.3. Qualitative assessment of services performed were elicited by (a) simulation technique covering different items of MCH care, e.g., skills for high risk detection, skill for carrying out simple laboratory tests, immunization, nutrition education, etc., and (b) on-the-job observation of different activities of MCH for assessment of quality of care using a pre-designed check list.

Each of the items under 1.1 to 1.3 were given differential scores as decided by a peer group comprising of senior faculty engaged in MCH work.

2. Intervention phase - The selected HWFs were trained by a team of doctors extending over four sessions of 1 1/2 hours each. The training was carried out by lecture and demonstrations covering important items of MCH care elicited by job analysis of HWF activities. Two on-the-job repeat visits were made during the next six months.

3. Post-intervention phase - Evaluation of the impact of training on the quality and coverage of MCH care provided by HWFs was carried out using the same techniques and tools as outlined under 1.1 to 1.3 above.

Results:

Table 1
Pre- and Post-training Knowledge Score of HWF Regarding MCH Care

Knowledge of	Pre-training Mean	S.D.	Post-training Mean	S.D.	't' test value
Identification [160] & management of high risk mother	105.0	16.7	154.8	5.5	10.8
Anaemia [64] identification and management	36.0	8.5	64.0	--	11.4
Tetanus toxoid [47] immunization	34.4	3.8	43.3	1.2	8.1
Screening and [161] management of malnutrition in children	96.3	15.2	154.7	2.1	13.6
Immunization [74] in under fives	56.3	4.5	73.3	1.6	10.9

Note : 1. Figures in brackets represent maximum possible score.
2. All values of 't' were statistically highly significant.

Table 1 shows the pre- and post-training knowledge score of HWF. Knowledge of identification and management of high risk antenatal cases, anaemia, malnutrition among children under fives and maternal and childhood immunization showed an increase after training.

Table 2
Knowledge Score of Trained & Untrained HWF

HWF	No.	Mean Score	S.D.	't' test
Trained	12	70.8	4.0	15.8
Untrained	12	34.2	7.0	$P < 0.001$

Note: Maximum possible score was 75.

Table 2 further shows that mean knowledge score of HWF who were given training was almost double than those of untrained HWF who formed the control group.

These findings confirm that training improves the knowledge of HWF for performing their jobs.

To assess the impact of training on the quantitative aspect of job performance of the HWF, item analysis of antenatal, child care, immunization and referral records were carried out.

Table 3
Pre- and Post-training Antenatal Care Registration and Follow-up by HFW

Activity	Pre-training No.	%	Post-training No.	%	'Z' test value
Antenatal registration	719		827		
1st trimester reg.	23	3.2	127	15.4	8.1
3rd trimester reg.	282	39.2	233	28.1	
Repeat follow-up (% of expected visits)		39.8		56.7	11.2

As can be seen from Table 3, antenatal registration during the six month period after training showed an increase over the corresponding period before the training. Equally important was the fact that proportion of first trimester registration, which was just 3.2% before training, increased to 15.4% after training. Similarly follow-up visit showed an increase from 39.8% to 56.7% of the expected minimum three visits per case.

Table 4
Quantitative Analysis of Work Performance:
Pre- and Post-training Scores of Item Analysis
of Antenatal Records (% of expected)

Items analyzed	Pre-training	Post-training	'Z' test value
History	53.9	94.9	40.8
Physical exam.	8.8	75.2	80.5
Investigations	-	64.7	-
High risk cases detected	-	27.1	-
Cases referred	2.1	25.2	14.4
Immunization performed	47.2	71.3	17.1

Note : 'p' values of 'Z' tests performed were statistically significant.

Table 5
Pre- and Post-Training Scores of Item Analysis of Under-Five Records
(% of expected scores)

Item Analyzed	Pre-testing	Post-training
Weight/Mid-arm circumference record	-	54.8
Malnutrition cases detected	-	30.6
Anaemia cases detected	-	17.6
Cases referred	-	14.4
Children given two or more doses of DPT	86.9	93.8

Tables 4 and 5 show that the content of antenatal and under-five care improved by way of history taking, physical examination, immunization and case referrals. Some of the activities, e.g., high risk case detection, anaemia case detection and laboratory investigations, weight record/mid-arm circumference measurement, in children which were not being performed (or if performed were not being recorded in service registers) before the training of HWFs were started after the training. DPT immunization coverage also increased from 86.9% to 93.8%.

To assess the impact of training on the quality of care provided by the HWF, visits and on-the-job observation was performed and scores made using a check list.

Table 6
Pre- and Post-training Score of Quality of Care Assessed by On-the-job Observation

Item of work		Pre-training Mean	S.D.	Post-training Mean	S.D.	Value of 't' test
History taking	(29)	18.8	3.9	28.4	2.0	6.9
Physical exam.	(33)	18.4	5.2	25.5	3.4	5.2
Urine exam.	(27)	-	-	27.0	-	-
Hb%estimate	(21)	-	-	21.0	-	-
T.T. Imm.	(43)	18.6	8.2	38.3	3.0	8.1
Nutrition education	(30)	7.3	1.6	29.6	1.4	63.6
Mid-arm circumference measure	(27)	-	-	25.3	3.2	

Note : 1. Figures in parenthesis represent maximum possible score.

2. All values of 't' were statistically significant.

Table 6 shows that post-training score for different activities, e.g., history taking, physical examination, tetanus toxoid immunization, nutrition education, etc., were significantly higher than before the training of HWF.

Applicability of the findings:

The findings of the study have shown that the training of HWFs has been useful in not only improving the knowledge and skill of the workers in performing their job but also has improved coverage of the cases. But the question which requires an answer is: Are these findings applicable within the health services set-up?

The state governments have established Health and Family Welfare Training Centres (HFWTC) for in-service training of the PHC staff. These centres are expected to periodically train the medical officers of PHC who in turn would train the paramedical staff working under them. In actual practice, a number of constraints reduce the applicability of this process. Some of them are mentioned briefly here:

1. The number of HFWTCs, its staff and facilities are often inadequate to train large number of personnel for whose training they are responsible.

2. The staff posted at HFWTC as trainers often lack training in teaching methods and thus are inadequately prepared to do their job. These postings lack incentives and prestige and as such the staff are constantly trying for transfer leading to rapid turnover of the staff.

3. Motivation on the part of medical officers of PHC for undergoing training are low, particularly when they are in practicing positions. Turnout of the staff for training are therefore often low. Even when they attend training programs, they in turn are reluctant to train the staff working under them because of low importance attached to this work.

4. There is paucity of suitable training material and audio-visual aids both at HFWTC and PHC which is also an inhibiting factor for teaching-learning exercise.

5. Evaluation of training material, training methods or trainees is seldom performed. As a result of this, whatever training activities are being performed at different level for different categories of staff remain unevaluated and deficiencies, if any, therefore remain uncorrected.

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LEAD DISCUSSION

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There is no denial to the fact that training can be an important and crucial intervention in improving the maternal and child health care and family planning services, as it would be in all areas of the delivery of health care. Further, noticing the fact that more than 70% of expenditures of the health system is incurred on wages and salaries of the staff, it becomes imperative to optimize their output. The health system further being a labor intensive activity is of greater relevance to look into the process of development of manpower resources. This development process has to be visualized as a comprehensive process including basic education, continuing education, re-orientation course, distance learning, self-study and on-the-job training, etc. All training programmes need to be organized according to the community health needs and the health care system. It should be based upon the tasks to be performed by the health functionaries and their knowledge, skill and attitudinal requirements both for delivery of health care and inter-relationship between different level of functionaries. Of the various types of educational programmes, the competency based and task oriented approach is considered to be most effective and efficient. Main feature of this approach are:

a) The curriculum is organized around health worker's functions in a specified setting.

b) The "output" of training is a health worker who can practice at a defined level of proficiency in accordance with local conditions.

c) It is assumed that the majority of individuals can master the required level of proficiency - given appropriate instruction and sufficient time.

d) It emphasizes more than experimental, on-the-job learning, problem solving and community involvement in health.

Further improved skills which are required for carrying out primary health care through the physicians and other para-professionals include:

a) Communication skill
b) Epidemiological skill
c) Sociological skill
d) Team skill
e) Educational skill
f) Leadership skill
g) Organizational skill
h) Medical skill

Keeping in view the specific requirement for effective participation of the health team in MCH and family planning programmes, there are a number of questions which need to be answered in respect of training interventions.

These are:

- What to teach?
- How to teach?
- Where to teach?
- Who is to teach?
- When to teach?

For working out the above details, it is very essential that a training need assessment be carried out, which should include working out job descriptions, duties, tasks and activities; person's background and present level of performance; persons' placement in the organization; organizational practices; support facilities provided; and the community response to the services provided. Such a study of training needs would help in working out specific requirements in respect to training, organizational development and support facilities to be provided for effective participation of the health functionaries. Even the basic management skills required for optimizing the output of the system have not yet been clearly worked out and very little attention has yet been given to establishing training programmes in these areas, either at the specialist level or at the peripheral levels. There is a need to establish national and regional centers for identifying specific training needs and to arrange for implementation and evaluation of training programmes.

Community Participation as Intervention for Performing FW Programme Services: A Case Study of Trained Dais

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The Family Welfare Programme (FW) has been in operation for a little more than thirty five years with a total expenditure of over Rs. 300 million[1] by the year 1987-88. From the side of programme achievements, it is rather disheartening that with all the net work of services spread over even to the remote corners of our country we have been able to protect only a little more than one third of our target couples[2]. Thus every year about 15 million infants are added to the total population. At the same time, the bulk of our people still consider the FW programme as the Government imposed programme and do not regard a small family as being in their or their family's interest. Several concurrent evaluation and field studies have established that community participation remains to be extremely weak resulting thereby in low achievements and shortfall in the fulfillment of the developmental plans and policies. It has also been realized that to attain the demographic goals set by 2000 AD the positive relationship between the level of increase in couple protection rate (CPR) and the level of reduction in crude birth rate (CBR) has to be secured, which at present is mostly not the case. The important requirement for bringing in quality in the service is the involvement of the community both for the delivery of health and family welfare programme services and also for generating demand for these services.

It is indeed a daunting task and still it is a hard fact. "The serious dimensions of our population problem and our undivided and urgent attention. sustained governmental efforts have to be backed up by people's participation to make a success of programmes in this area" (Statement by Shri Rajiv Gandhi, the Prime Minister of India)[3]. This indicates that regarding the problem of over population although it has been assigned top most priority by the government, the contribution by the masses in the form of owning the programme services has not been coming through. In this paper an effort has been made to answer the following three questions:

i) What is community participation?
ii) How can community participation be sought?
iii) What are the advantages of community participation?

In the second section of this paper results of a case study of the trained dais conducted on community participation by the Population Centre, Uttar Pradesh, have been presented.

Answer to First Question

It is often said that the family welfare programme lacks community participation. the field workers, again, most of the times ask what is community participation? To answer their question in a more practical and simple language, community participation is the involvement of people in the programme efforts. These programme efforts may be in terms of either administrative - helping the government in the implementation of family welfare schemes (selection of community health volunteers), or technical - when experts

(medical, papa-medical, social workers) provide free services for the planning, implementation and assessment of the programme. The third example of the involvement of people may be the provision of financial support by way of donations for the services arranged, paying salary to the local voluntary workers and collecting money for the special type of medicines required. More specifically, the instance of participation of the community in the family welfare programme is the one when people own the programme, they feel committed to its success, they diagnose their needs and ask for the services. Also, people do not grumble for the weaknesses but suggest solutions for its improvement.

From the side of the Government, Community participation is taking the people along with the programme through identification of their needs. ALso helping the masses to know about the various components of the programme or creating awareness through mass media and face to face interactions. Another example of seeking community participation may be the provision of complete and correct knowledge of the available programme technology (family planning methods). Arrangement of quality services supported by good after care of the acceptors so as to take care of their discomforts etc. also form part of the community participation. All the above activities, combined, help people to be more mobile and come forward for the services. In this way community participation is a two way process and moves in a circular form, whether we start from the side of people or from the side of Government, results are the same.

Answer to Second Question

Review of the literature shows that the most significant ways of securing community participation are the 'Close Interaction,' 'Face to Face Talks', and 'Inter-Personal Contacts'. The formula propounded by the John Hopkins Population Bureau may be extremely helpful in this regard. It is the six alphabet term known as GATHER which has been explained as follows:

G = Greet clients politely
A = Ask clients their requirements
T = Tell clients all methods
H = Help clients to make choice
E = Explain the use of method(s)
R = Return visits for follow up.

Looking into the magnitude of the work, it may not be feasible to adopt the methodology of meeting each individual of the community from the point of view of the efforts as well as finances required. However, personnel working for this cause must make use of this approach as a part of their job functions and to help in the improvement of the programme acceptability.

The other way to seek community participation is involving the non-government (NGOs) and the Voluntary Organizations. A number of studies conducted in this field have depicted that the necessity of family welfare programme have been realized by almost all the organizations and individuals, willingness to work for the programme has also been found to be quite high and some of them have already contributed in the form of motivational activities in this programme[4]. Still their contribution has not been substantial. On this question most of the NGOs (Legislators, School Teachers, Staff of other

Departments, Private Medical Practitioners, Dais) reported that their involvement has not been sought. It is against this background, that a few of the schemes tried in the field for the community have been suggested. These are:

i) Orientation Training Camps;
ii) Community based Service-motivation and supplies by local people (Teacher);
iii) Motivation-Education and Services by Community Health Volunteers (CHCs);
iv) Village Health Committees;
v) Trained Indigenous Dais

Most of the above schemes have already been implemented, assessed and results documented by different research institutions[5]. Although no one scheme can be singled out and considered the best, it is the coordination between the Government set up and the NGOs which really is helpful in achieving the results[6].

Answer to Third Question

The advantages of community participation are manyfold. To begin with, it can be said that with the help of community participation, the necessity of planning and execution services becomes almost a routine activity. Because demand comes from the people themselves, they even decide the strategy where and what to give as a part of services. In regard to finances also it is the people who decide, whether services should be free or some nominal amount of money may be charged. Authorities do not have to worry about the control and supervision of the staff, they can concentrate on finding out the new developments in the technology, strategy etc. In brief, with the help of getting full cooperation from the masses, both quality and quantum of services may improve and departmental workers may enjoy good image.

Having said a few conceptual remarks about the community participation, results of a case study on the involvement of 'Trained Indigenous Dais' have been given in the following paragraphs. This is based upon the report of the experiment tried in one of the IPP districts, by the Population Centre[7]. The main objective of this experiment was to known whether Dai can work for the Family Welfare Programme. If yes, what should be her working methodology? How to Coordinate her work with the work of Female Health Worker? and what should be the amount and mode of payment of the honorarium given to Dais.

This experiment was implemented in the two PHCs and four subcentres of Ghazipur district. Design of the experiment can be seen from the following chart:

Chart Showing Design of Various Strategies

District

PHC-I		PHC-II	
Sub-centre I*	Sub-centre II**	Sub-centre**	Sub-centre IV*
Area	Area	Area	Area
4 to 5 villages covering 4000 to 5000 population of interior are of the Sub-centre	Entire 10000*** population	A few villages around the Sub-centre Head quarter	4 to 5 villages covering 4000 to 5000 population of interior area of the of the Sub-centre
Number	Number	Number	Number
5 trained Dais	5 trained Dais	5 trained Dais	5 trained Dais
Honorarium	Honorarium	Honorarium	Honorarium
Rs. 50/- per month	Rs. 50/ - per month	linked with performance	Rs. 50/ - per month
Mode of Payment	Mode of Payment	Mode of Payment	Mode of Payment
Fixed	Fixed = Rs. 30 Linked with performance = Rs. 20***	Weekly disbursement	Fixed = Rs. 30 Linked with performance = Rs.20****

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* Our trained Dais per village to cater to the needs of her clientele only.
** Trained Dais can work any where in the sub-centre to cater to the needs of the population of that area.
*** Population for each sub-centre was 10000 at the time of the preparation of the experiment.
****This amount depends on the performance of the Dais

The experiment which was implemented in three stages, remained in the field for about a year. In the first stage the required number of Dais were selected and they underwent a one week training programme. During this period the selected Dais were exposed to the following topics:

a) Objectives of the experiment and need for involving the train Dais in FP programme;

b) Functions of the trained Dais, ANMs, Lady Field Supervisors/PC in general and in this experiment, in particular;

c) Philosophy behind the amount of honorarium and mode of payment followed in this experiment;

d) Coordination between the working of trained Dais, ANMs, and other departmental field workers;

e) Details of the working methodology prepared specifically for the delivery of FW and MCH programme services;

f) Service supply arrangements including service units and functionary incharge of these units in the family welfare and MCH programmes;

g) Family Planning Programme methods, definition of target couples, motivation and education, arrangements for follow up services, and the role of trained Dais in providing all these services;

h) Immunization Programme Services - Type of Immunization, time at which these services should be given, doses for each immunization programme and definition of beneficiaries.

Considering the illiteracy of the Dais and to coordinate her activities with the working of the Female Health Workers of the experimental area the following inputs were given in the second stage.

i) MCH Register - Immunization Register

ii) FP Motivation - Education Register

iii) Nirodh Distribution Register

iv) Oral Pill Distribution Register

v) Coupon Books for referring registering the cases for MCH and family planning services.

Dais were told that whenever they talk to any person (mother or a child) they have to give a coupon to the potential beneficiary in case he/she is ready to accept that service. In the same way the registered case was told by the Dai the need for producing that coupon to the ANM or to any other service provider who provides services wither at the sub-centre clinic or in the camp held in the village itself.

Thirdly, the ANMs of the selected sub-centres made a point to check the counterfoils of the coupon books of the trained Dais during their field visits as well as at the time of their visit to the sub-centres. In all, six records, five coupon books for different programmes and one small size register for Nirodh distribution were given to the selected Dais. The coupon books were of different colours and had different symbols related with different programmes.

In addition weekly time schedule was prepared in which all the cases identified/registered by the Dais were provided the required MCH (ante-natal, natal, post-natal) and Family Planning (distribution of Nirodh, oral pills and IUD insertions) services, by the Female Health Workers through her weekly visits to the villages and holding clinics there. Same way follow up services were strengthened by the combined work of Dais and Female Health Workers. As a part of this experiment functions of the Dais were identified. They were given the following functions:

1. Registration of pregnant mothers and children for providing MCH programme services;

2. Family planning motivation education in favor of various methods of family planning to the target couples; and

3. Distribution of Nirodh and oral pills to the target couples for spacing between two births.

With the help of this experiment the achievement of these sub-centres and villages improved quite a bit. (Table 1 to 6 given in the annex to this paper)

To know the contribution of Dais achievements of the experimental area and their own achievements were compared with the achievements of the sub-centre.

Table 1: Total Mother Beneficiaries in the Experiment

Strategy/ No. of mothers	Ante-natal regist-ration	Tetanus toxoid to registered mothers	Distribu-tion of Iron Folic Acid Tablets	Delive-ries conduc-ted	Percent Delive-ries conducted against ante-natal regist-ration
Strategy I	312	147	115	271	86.9
II	438	159	106	309	70.5
III	344	214	291	308	89.5
IV	291	220	169	209	71.8
Total	1385	740	681	1097	79.1

Table 2: MCH Programme achievements of Trained Dais

Strategy Area	Percent Contribution by Trained Dais			
	Ante-natal	Tetanus Toxoid	Iron Folic Acid Tablets Distribution	Deliveries Conducted
I	60.6	43.5	47.8	54.3
II	78.6	41.5	80.2	67.6
III	47.7	43.5	29.6	77.3
IV	69.4	63.6	64.5	74.2
Total	64.9	49.1	49.2	68.3

Table 3: Immunization Programme for Children in the Area of Different Strategies

Strategy/ area	Total Beneficiaries				
	DPT	Polio	DT	TAB	Iron Folic Acid Tablets
I	251	125	81	233	36
II	239	269	82	91	36
III	154	53	77	22	17
IV	60	-	120	24	17
Total	704	474	360	370	106

Table 4: Immunization of Children by Trained Dais

Strategy	Percent contribution by Dais in Different Program				
	DPT	Polio	DT	TAB	Iron Folic Acid Tablets
I	44.2	75.2	1.2	5.6	100.0
II	58.2	42.6	2.4	38.5	100.0
III	54.6	100.0	22.2	27.3	100.0
IV	66.7	Nil	8.3	100.0	100.0
Total	53.1	58.3	8.3	21.1	100.0

Table 5: Total Acceptors of Various FP Methods in the Experimental Area

Strategy	Acceptors of FP Methods				
	Sterili-zation	IUD/ Cooper-T	Nirodh Users	Total	Equivalent St. Acceptors
I	17	51	55	121	38
II	49	22	148	219	68
III	68	16	52	36	77
IV	28	4	40	72	32
Total	162	93	293	548	215

Table 6: Family Planning Acceptors motivated by Trained Dais during Experimentation Period

Strategy	Sterili-zation	IUD/ Cooper-T	Nirodh Users	Equivalent Sterilization Acceptors
I	17.8	49.0	71.7	36.8
II	51.0	40.9	93.3	58.8
III	19.1	12.5	71.2	22.1
IV	32.2	100.0	70.0	37.5
Total	44.7	43.0	82.3	38.6

It was also attempted to see the contribution of the Dais who were involve in the family welfare services by separating the performance figures of the subcentre and the contribution of Dais in FW, MCH and Immunization of children programmes. Performance of various methods of family planning was also improved.

Assessment from the three angles enable us to conclude that Dais were useful for the family welfare work. They could mobilise the community in accepting the Immunization and family planning services. Yet it was not automatic and it was supported by the staff of the Population Centre. Thus more efforts were needed from the programme implementation agency. It is proposed that the programme implementation agency should put more stress on the activities related with community participation either through OTCs. village influential persons, Village Health Committees or trained Dais along with the regular service arrangements. Otherwise family welfare programme would remain as a Government imposed programme.

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Community Participation as Intervention for Improving Family Welfare Services

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1. INTRODUCTION

Today it is a well known fact to most of the people that the most crucial problem in the country is "increasing population." This galloping population which doubled during the last 30 years and is expected to double once again over the next 40 years of time if not intervened by appropriate technology. Realizing that this crucial problem is not only neutralizing the other hard earned developmental gains in the country but also in the process jeopardizing the health and happiness of the people, the Government of India launched the National Family Planning Programme officially as the first in the world in 1951[9]. It was evident that a rapid decline in the birth rate had to be brought about in order to check the population. The very decline in the birth rate would only be possible if substantially more and more couples were persuaded to restrict family size by using one or the other method of family planning. Various experiences revealed that acceptance of family planning method was closely associated with infant mortality, socioeconomic standard and status of women. Initially this National Family Planning Programme was designed as a clinical approach. But an isolated approach of family planning could hardly be effective. In the mid-60s the approach received some extension and in the late 70s gradually expanded to a community oriented service network in which family planning services were included as part and parcel of an overall health package of services. Since then the very National Family Planning Programme got a new name as the National Family Welfare Programme by adopting maternal and child health and nutritional activities. The increase in the budget allocation from Rs.0.1 crore(100,00,000) in First Five Year Plan to Rs. 2256(22560,000,000) during the Seventh Five Year Plan emphasizes the importance paid by the government to this programme.

The awareness, at the global level, of inequalities in the health status of people in the world led to the goal of achieving "Health For All (HFA) by 2000 A.D." through Primary Health Care approach and resulted in the international conference on Primary Health Care sponsored jointly by the WHO and the UNICEF which took place in Alma Ata, USSR, in 1978. India is also one of the signatories to this Alma Ata Declaration and formulated its national health policy to achieve this goal of HFA by the year 2000 through PHC approach.

The policy on Family Welfare Programme demands the promotion of the programme on a voluntary basis as a 'people's movement' in keeping with the democratic traditions of the country. Motivational, educational, and persuasive efforts are made for the promotion of responsible parenthood with a small family size norm through an independent choice of the family planning method best suited to them. The Prime Minister of India, in his recent communication to the Chief Ministers of States/U.Ts. has reaffirmed his commitment to the implementation of the programme on a voluntary basis without any element of compulsion in family planning. On the basis of this philosophy

'People's participation' is sought through all institutions, voluntary agencies, opinion leaders, people's representative and government function arises.(9) The national goal of reaching NRR of unity by 2000 AD, with a birth rate of 21, death rate of 9, infant mortality rate of below 60 per 1000 live births and couple protection rate of 60%, might only be possible by involving the people in the true sense. If these services are planned and operated by the people who need them, the misuse and underutilization of the services which might be coming in the way of achieving the target, could be reduced to a minimum. By the community adopting this as its own responsibility it might even be possible to expand the services by providing or contributing additional resources in terms of money, material, means and manpower and redistribution of resources. "Community involvement and participation" is very rightly given priority over many supportive activities needed for the successful implementation of PHC strategy in many documents published by the WHO.(27)

But now the question is what do we really mean by "community participation" and how we could use this as an intervention for improving family welfare services.

2. CONCEPT OF COMMUNITY PARTICIPATION

Community participation is conceptualized by many social scientists in various ways. Two views about community participation in health are expressed in 'Contact' special series No.3(19). One view takes it as a means to deliver better health services or takes it as an 'input' to health services. Whereas the second view looks at it as a means or process to bring required social changes in order to improve health. Peter Oakley and David Merson gave similar expression but considered community participation as an 'end' when it is meant a process to bring about social changes.(17) In a number of articles, S. Rifkin very clearly expresses her assumption of community participation as a 'dynamic process' which is in a constant state of change.(18,19,20). 'Community Participation' is assumed as a process or an 'end' (by Oakley's Version) in this paper and the principal means to establish this process are discussed. Keeping in mind the state of health, maturity or the awareness level of the people in the community in typical third world countries, their educational cultural background, the national framework of bureaucratic institutions and also the availability of resources, the means of establishing community participation are suggested. Various formal structural and institutional mechanisms and a number of informal mechanisms may be suggested as the means and their chances of success are discussed.

3. TYPOLOGY, LEVELS AND APPROACHES

Three types of Community Participation may be assumed as 'Spontaneous', 'Induced' and 'Coerced'. The spontaneous type of community participation should be established, but sometimes in the beginning some communities need to be induced or coerced by a catalyst and gradually be changed into the spontaneous type. In the same way the nature or form of participation may change from 'passive' to 'active'. The nature of participation depends on the level or stage of participation. There are three main levels in which people participate can be described. The first level is most narrow in range and depth and the third level most wide. These levels are:

a) Cooperation

The community is supposed to take the benefits out of a health or social welfare programme sanctioned, formulated and operated by government. The community does not play any role in these programmes except to take the benefits. This is a 'passive form' of participation.

b) Contribution/Participation

The community participates in decisionmaking specially in the stage of implementation of the programmes but not in the stage of formulation which is done by government agencies or professionals. People are expected to take an active part mainly in order to contribute resources in the form of labor, money and material. Even though this is a form of 'active participation', it cannot be labeled as 'Community Participation" in the true sense an outside agency remains in total control of the process.

c) Involvement

Involvement can be defined as "a mental process in which individuals and communities identify jointly with health professionals and other concerned, for decision and activities."(3) It grows only out of involvement in thinking, planning, deciding, acting and evaluating, and focuses on one single purpose--'development,' of which health is a major part. At present in our country, family welfare demands to be on the top of the priority list of people as needs to be met in order to achieve the national goal. In this stage the community develops a sense of belonging, self-generation from the onset to the end and activities and policies are evolved from within the community mostly without any external or governmental support. It is spontaneous active participation. It does not need to be induced or coerced by catalysts.

These three stages can be linked with the three different approaches developed by S. Rifkin(18) on the basis of i) definition of health and ii) planners assumptions of the communities responses to this definition. These approaches are:

i) Medical Approach

The medical approach is based on the definition of health as "the absence of disease." It defines community participation as following the orders and directions of medical professionals in order to reduce individual illness and improve the environment. This approach can be identified with 'co-operation'.

ii) Health Services Approach

It is based on the definition of health by WHO and a view of an improvement in health as essentially the result of the appropriate delivery of health services. It defines community participation as the mobilization of community people to take an active part in the delivery of health services. This can be identified with contribution.

iii) Community Development Approach

It is based on the definition of health as a human condition resulting from social, economic and political development. It relies on a decision making process focusing on 'community wants' rather than 'planners' needs'. It defines community participation as community members being actively involved in decisions about how to improve their condition in order to bring about development.

The first two approaches believe that health services are the most important factors to bring improvement in health and relies on 'top down process'. The third approach believes that people's perception of health and their motivation to change health care are the most critical factor and relies on 'bottom up process'. It stresses the importance of people learning and deciding themselves the ways in which health can be improved. Community participation in Family Welfare Services needs to be established in this approach. All these stages, nature, approaches, process can be summarized in this form:

Table No. 1. Different types of Community Participation

Levels	Nature	Approach	Knowledge with	Process
Cooperation	Passive	Medical	Med. Profls	Top down
Contribution	Active	Health Services	Health Planner	
Involvement	Active	Community Development	Community	Bottom up

(16) True participation in PHC means: the people should be involved in:

i) Initial assessment of the situation

ii) Defining the main health problems

iii) Setting the priorities for programming

iv) Drawing out a plan of action according to the priorities

v) Implementing the activities

vi) Monitoring and evaluating the results

vii) Reprogramming

The concept is equally applicable to family welfare programme and its services.

E. de Kadt also emphasizes community participation in the sense of 'decision making', 'in the level of involvement' and 'community development approach'.(5) The means of establishing community participation in PHC should be based on the concept of its 'active nature', level of involvement, 'knowledge with the community': 'community development approach' and 'bottom-up process'.

4. SUGGESTED MEANS OF ESTABLISHING COMMUNITY PARTICIPATION AS AN INTERVENTION TO FAMILY WELFARE SERVICES

Because of the heterogeneity of the communities, no universal standard model of community participation can be developed. Considering the social, economic, political and cultural structure of the community and its maturity, community participation can be established by any or few of the suggested means. Possible means of establishing community participation for family welfare services may be either by 1) formal or 2) informal machineries.

4.1.1. Formal Machineries

Formal machineries can establish community participation on the basis of an assumption that there is general acceptance of the importance of community participation in family welfare programmes at each level of governmental structure and there is willingness to readjust the existing structure and procedures.

4.1.1.1 Structural means

Structural means include 'decentralization' and 'intersectoral collaboration'.

4.1.1.1.a Decentralization

It maybe seen as one of the means to establish population participation. Rondinelli defines decentralization, as a process of transferring planning decision making and management functions from central government and its agencies to field organizations, subordinate units of government, semi autonomous area wide or regional development organization, specialized functional authorities and non governmental organizations.(21) And D. Conyer states, "Decentralization is in particular seen as a means of, first improving the planning and implementation of national development especially those concerned with rural development, secondly facilitating effective population participation in process of development in a more proformed way than envisaged in the earlier decentralization programmes." Whether decentralization programmes initiated by the central government as in the case of Tanzania, Zambia and Ghana or by pressure exerted from regional or local group as formed in Papua, New Guinea and Sudan, 'population participation' is a major objective of their decentralization programme.(4) In simple way of saying there is a need for 'real devoluation' of power down from the centre to establish community participation. Certain governmental functions may be handed over to local councils/bodies, setting up norms by centre in case of central funding and community participation can be established through these

councillers for family welfare services. The success will depend on the members of the councils, their ideas of health, and of the ways health can be improved. If they are convinced about the importance of the family welfare programme, they will help in motivating people, accepting the use of family planning methods, promoting small family norm, organizing women's education programmes, immunization (UIP & EPI) programme, nutritional activities, maternal care, etc.

4.1.1.1.b) Inter-Sectoral collaboration

For implementation of the primary health care approach to health care of the people, inter-sectoral collaboration at each level, i.e., national, regional, provincial and specially in the district is one of the most essential strategy. In order to bring development, each sector involved in the process, may see their target groups from various angles and does not understand the view of the other related sectors. Target groups or the people of the community cannot effectively participate in family welfare as one of the elements of PHC approach unless there is an integrated approach which can be established by means of inter-sectoral collaboration at each level of the structure. The family welfare programme should be fully coordinated with other socii-economic programmes like integrated child development scheme (ICDS), national adult education programme, which have been launched by different Ministries or Departments of the Government. A close coordination between an Anganwadi worker of ICDS project and health worker of family welfare programme through people would be an excellent idea for achieving the national target.

4.1.1.2. Institutional Means

The existing institutional structure with local government bodies may establish community participation. But these local government bodies should have substantial authority and responsibility for local affairs to make it successful. Some of the institutional structures are:

(i) Village Council

An elected body at the village level which is representative of the people. Through this council the community can develop a close link with the governmental agencies and NGO's for any developmental activity and participate in the planning, implementation and evaluation stages of family welfare programmes for that village. The constraints are the members of the council who are usually the elites of the village and may take health care as only curative care and actively participate only in those activities in which they find some vested political interest.

(ii) Village Development Committees

A village development committee can be formed by a representative elected from within local communities by the villagers themselves and local field staff of government to establish community participation. This is tried in Gambia. This is a multi-sectoral coordinating body. The committee is responsible for coordination of matters concerning development of the community, selection of VHWs and TBAs and to engage and remunerate them and generating resources from within the community for the purpose. This committee

is also responsible to establish and maintain community involvement in village health services in collaboration with governmental departments. In many other countries such committees are formed and in our country it is named as village health committees.

(iii) Community Health Worker/Village Health Worker/Village Health Guide

The workers at the village level from within the community like VHG/CHW can be used as means to establish community participation. They can really work as catalysts to the community for their initiative and involvement in family welfare programmes in the beginning and gradually change it into spontaneous participation. Their major functions are focused on the mobilization of their communal effort towards preventive and promotive aspects of health care.(12). The constraint is that they may develop a medical approach towards community participation which may restrict participation to passive cooperative even though people usually do not gain as much confidence in them as they do in professionals.(15).

4.1.1.3. Use of Educational Process

Educational process can be used for the following purposes in order to establish community participation.

(a) In Conscientizing the community

Health education activity alone are not sufficient to make people aware of the health problems, associated problems and causes, and the prevention of these problems. A continuous and vigorous educational effort is needed to make people knowledgeable and aware of the primary health care approach particularly family welfare programmes, governments' responsibilities towards it and their own responsibilities to achieve it. These educational processes need not be programmed as separate activities but each and every activity of any developmental programme must include this aspect. To begin with in some more specific and priority areas, adult education programme and women's education programme can be organized.

(b) In preparing the workers

The community level workers and their supervisors have to be trained and educated to take into account their technical tasks and their educational responsibilities, to understand the local environment, the socio-economic structure and the ways of promoting community involvement.

(c) In educating management personnel

The management personnel needs to be reoriented to the community structure, the life style of the people, especially the poor people, social system, etc. in order to develop a rapport with the community and to achieve the national goals for health and family welfare programmes.

4.1.1.4. Use of small scale projects by voluntary/non-government organizations

Effective community participation specifies involvement of the community in decision making. E.de Kadt emphasizes that there is more scope

of community involvement in decision making in small scale projects sponsored by voluntary/NGO's[5], since non-government and voluntary agencies are more flexible and can adjust to the communities felt needs. An example can be traced in "Rangabelia Project in Sundarban by the Tagore society for Rural Development." About the aim of this project, Tusharkanjilal said - "Our aim is not just to give people a handful of food or a few clothes instead through experimentation, we would like to develop the village through self-reliance." At present, it is gathered that the project is almost being run by the people themselves.

4.1.1.5 Formal Groups

Various groups may be formed to establish community participation. Many developing countries have already tried to form various groups like:

(a) Voluntary body - for a specific job in the community, can also be used for a specific aspect of family welfare programmes.

(b) Self help group - of people from the community to take care of some local problems and take action to solve them.

(c) Task group - a group of active people (especially young people) for various tasks related to family welfare programme to be performed in the community.

(d) Youth Club - the young men of the community may be organized in a formal structured group and get actively involved in developmental activities including family welfare services.

(e) Ladies group/women's group - all the active women can be organized in a group. If the mothers are motivated and involved, many problems can be solved more easily. The example of women's movement in the Dominican Republic shows the effectiveness of such a group.[11]

4.1.2. Informal Mechanism

At time it may be possible to establish community participation effectively by informal means. These informal means may be either by:

(a) Any informal groups - like 'neighbors' groups' which may be formed without any formal structure. Sometimes such groups are very influential and successfully establish involvement of the people with them. At times experience of practicing family planning methods of some people help in motivation and acceptance of the particular method or any other elements of the programme.

(b) Informal leadership - Any dedicated individual with missionary zeal who is living with the people in the community can motivate and involve the people in the activities.

This was found to be very effective in India in various political movements. The same may be achieved in family welfare services.

5. Overview of some of the works carried out by different organizations

The concept of 'community participation' has been applied to different developmental integrated projects focusing on family planning activities and delivery of health services towards the end of the last decade. Reference to this has already been made by many social scientists in different articles. It is worth mentioning a few of such important projects for drawing on our memories from the past. As the details of these projects were already elaborated in many previous papers, these are not discussed here. The following examples with their reference were given below.

(1) The Jamked Comprehensive Rural Health Project - launched in 1970 by Dr. Rajnikant and his wife Mabel Arole in Jamkhed Taluka of Ahmed Nagar district in Maharashtra State. Reference to (10)(23)(3).

(2) The Malur MCH and Family Planning Project - In 1977, the Family Planning Association of India (FPAI) was entrusted this project by the State government of Karnataka for promotion of MCH and family planning services in Malur Taluka through its PHC. Reference to (10).

(3) The Vadu Rural Comprehensive Health Project - The project was implemented by KEM Medical College, Pune in collaboration with the zila parishad and state government of Maharashtra in the Vadu Budruk Block in Sirur Tehsil of Pune district in 1977. The CHG's trained in this project facilitated the delivery of family planning services and established a link between the Health Centre and the community. Reference to (10)(23).

(4) Rangabelia Health Project - This health project was launched in the remote areas of Sunderbans of West Bengal covering thirty-seven villages in five islands. In this area even the minimum infrastructure facilities of health delivery system was not available. It was funded by the Tagore Society for Rural Development. The initiation of this developmental project started in the late 60s and extended to health services gradually by the involvement of the local people, which definitely improved in maternal and child health status in this area. Reference to (14).

In addition to these memories it would be better to add an example of an action research project conducted recently by the National Institute of Health and Family Welfare (NIHFW). The theme of the project was 'People's Health - A Concern of the People'. The project was prepared as an innovative research project entitled "Institutionalizing Community Health Programmes Through Participatory Health Communication and Action." The project was given to the NIHFW under the leadership of Prof. Somnath Roy by the M.P. Government as one of the DANIDA area project in M.P. The actual implementation of this action research project was assigned to Prof. D.C. Dubey. Dr. Amita Bardhan and Shri BBL Sharma. The overall general objective of the project was - "promoting community awareness, knowledge and competence to organize for and mobilize community and outside resources for meeting health goals of the community." This objective emphasized the involvement of the people in health programmes. The specific objectives at the local community level were defined by the people in partnership with the project staff, which, being community specific differed from community to community depending on their felt needs.

Methodology

A simple three lined strategy was evolved for the implementation of the project. This methodology was based on three major components of -

1) Communication/education

2) Community interest groups/institutions (existing or newly created)

3. Community specific health activities

The schemes which were established to cover each of these three components are given below.

i) For Community Interest Groups-

- Panchayats
- Cooperatives/other interest groups
- Schools
- Village health committees
- Women's health groups
- Children health Clubs
- Village health Guides
- Youth groups
- Other health workers

ii) For Information, Education and Communication

Keeping in mind the importance of continuity and coordination in the communication process be as a two-way process, the following schemes were established.

- Personal home visits
- Small group meetings and Bullawa (informal women meeting)
- Planning meeting VHG, women's health groups, children's health clubs, etc.

iii) For Community's specific health activities -

Small projects were developed by the people of the community which were funded by the DANIDA from contingency fund and even some were funded by the MP Government. Mostly the projects were on the following health activities:

- For general environment and sanitation activities - e.g., soak pits, compost pits, chlorination of drinking water, sanitary latrines, etc.

- Disease related activities - e.g., immunization, postnatal fever, CRT, drive against malnutrition, etc.

- For other health related activities - e.g., plantation and kitchen garden, electrification of village, improvement in schools, mobilizing community resources for all the activities, particularly for MCH and family welfare.

This project was launched to cover 42 village of three DANIDA Area Project District in Madhya Pradesh (Giwalior, Datia & Sagar) which are backward areas. The area was not economically bad but the utilization of health services, particularly acceptance of family welfare services was poor.

Impact of the project

Within a period of 2 years of implementation of this innovative field based participatory action research project, both quantative and qualitative changes had been noticed. The general responsiveness of the community and its various interest group towards the acceptance and utilization of the health and related services was noticed. The villagers initiated a number of health activities which were also the priority areas of the state government, e.g. treatment of scabies, chlorination of drinking water, etc. These type of activities even got funded by the State government itself. The family planning targets which were prepared for this implementation period were achieved in a very short time. If it would continue in the same speed the national targets might have been achieved by the year 2000 A.D. The most important effort of the project was creation of 'multiplier effect'. The awareness was not only achieved in these villages, it even spread over to the neighboring villages to the extent that those villagers came forward and asked the various interest groups of the project to organize similar health care activities in their villages also.

The State government also took a lot of initiative and conducted two consecutive workshops for continuation of the project in which the mass media officers, the block extension educations, etc. as key persons from each of these three districts participated.

The National Institute of Health and Family Welfare was given the responsibility of preparing the methodology for this action research project and to initiate the implementation of the methodology through various schemes. For two years the implementation was carried out by the institute and later handed over to the state government.(8)(23)

Since then it has not been possible for the NIHFW to carryout any evaluation study of the same project.

6. Scope in next decade

The National Family Welfare Policy itself emphasizes more the spacing method than the terminal method: To accept and practice the spacing method, no

compulsion will work but voluntary actions taken by the couples themselves, which means involvement of the people.

The government has also enhanced substantially the budget allocation to voluntary agencies so that they are supported and encouraged to develop more and more innovative schemes which would involve the people of the community.

In IEC training scheme, recently launched by the government with USAID, in four states (U.P., Bihar, Rajasthan and M.P.) directly under mass media and communication (MMC), there is a lot of provision to involve people through the link persons. One such link person preferably a female is being selected out of 20 couples/families, purely on voluntary basis. This scheme will continue in the next decade.

7. CONCLUSION

There is overall realization of the fact that one can bring the horse to the water but cannot make it drink unless and until it wants to drink. The same theme is applicable to the providers and consumers of Family Welfare Services. For the effectiveness of this National Programme involvement of the people through 'community participation' is a 'must'.

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LEAD DISCUSSION

L. Ramachandran

It is not a new concept but it has been neglected.

With his vast experience and forethought, C.E.A. Winslow, a former Professor of Public Health at Yale University, gave in 1920 a definition for public health as follows:

> "Public Health is the science and art of (1) preventing disease, (2) prolonging life, and (3) promoting health and efficiency <u>through organized community effort</u> for:
>
> (a) the sanitation of the environment,
>
> (b) the control of communicable diseases,
>
> (c) the education of the individual in personal hygiene,
>
> (d) the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and
>
> (e) the development of social machinery to insure everyone a standard of living adequate for the maintenance of health so organizing these benefits as to enable every citizen to realize his birth-right of health and longevity."

He was very particular to include the phrase, "<u>through organized community effort</u>." In his book, 'Medicine and Social Welfare,' the medical historian Henry Sigerist has mentioned, "the peoples' health ought to be the concern of the people themselves; they must struggle for it and plan for it. The war against disease and for health cannot be fought by physicians alone. It is a peoples' war in which the entire population must be mobilized permanently."

Advances in biomedical sciences can give us any number of solutions for the health problems. But the major constraint is the application of the technology in the community and making it acceptable and utilized. The importance of the influence of the sociocultural and socioeconomic aspects on health and health related behavior has been realized long ago and yet 'community participation' has remained an aphorism without translation into action in many countries of the world.

The source scripture for health planning on our country is the Bhore Committee Report. It has dealt very well on health education and community participation. Around the time when the first set of primary health centres was to be established, we had a very sensible development programme designated as the 'Community Development Movement.' Just like we define democracy as 'the government of the people, for the people and by the people,' the philosophy of community development was helping people to help themselves to achieve and realize their felt needs and to improve the quality of life. The

strategy that was recommended for community development had two components. One was community organization or mobilization and the other was extension education.

It was also an integrated approach for giving a uniform thrust for all developmental efforts in order to avail of the complementary effect among the different spheres of development for forging towards total human development. It was envisaged at that time to have workers from different departments working together at the community level and to plan, implement and monitor all the development programmes along with the people. Unfortunately such an integrated approach did not last for long and the extension education was confined to agriculture. Rural reconstruction through human resource development as cherished by Mahatma Gandhi was the goal of community development. But for various reasons (political as well as administrative) the community development scheme and the national extension scheme which followed it were rather short lived and were not pursued vigorously after the first two Five Year Plans.

Much later the minimum needs programme and 20 point programme and integrated rural development programme were introduced. Whatever may be the name of the development programme, the philosophy remains the same. Innovations and improvements in technology must benefit the common man; they have to be accepted and used; and for this the 'involvement' of the people is necessary.

While it is generally accepted that education or literacy improves awareness, attitudes and acceptance, it cannot be categorically stated that education alone has a predominant influence on attitudinal changes or behavior. (Any number of examples can be given of well educated individuals and families following wrong practices and having wrong attitudes due to tradition and influences from family, kinship, peer groups, etc.)

In every one of our health programmes, it has not been possible to achieve the desired results of impact mainly because the community has not been properly and adequately involved.

Probably malaria could have been eradicated in the late 60's, before the development of resistance in the mosquitoes for insecticides and resistance of the human being for anti-malarial drugs, if the community had been mobilized and taken into confidence to avail of the spraying programme and surveillance programme promptly and fully. Leprosy and tuberculosis control programmes are also beset with the problems of defaulters and incomplete treatment mainly because the social (behavioral) aspect has not been taken care of properly. The family planning programme is another glaring example of inadequate community involvement and participation.

If from the beginning of every programme more time and energy had been spent by the health functionaries in informing and discussing with the people about the desired course of action to tackle any health problem, we would not be talking today again after nearly 50 years about community participation as a fresh challenge or concern. It is rather a pity that the member countries of the WHO had to be reminded about this at the Alma-Ata Conference in 1978, and it is ironical that community participation still continues to be merely a slogan or adage.

In family welfare services, many activities have been appropriately planned to reduce morbidity or mortality among mothers and children. But it is repeatedly found from evaluative studies that the coverage is appallingly poor. There are many reasons for such poor coverage. Some of them are the difficulties faced by the health functionaries in reaching the community. It is also found that the community is not very keen or interested to avail of the services. It is being reported that more than 80% of the deliveries take place in the home under the assistance of persons who have not had any opportunity to know the essentials of aseptic precautions. The idea of being hospitalized is so abhorring and frightening that even though there is a risk of life for either mother or child, the advice for hospitalization is seldom taken seriously. Even for routine antenatal check-ups, there are inhibitions or apathy.

The peripheral health functionaries when they undergo training in the paramedical training schools generally get some orientation about extension education. But it has been seen that by and large when they are officially appointed and posted in health centres, they fall into a rut of doing a mechanical routine of activities assuming that they are 'giving some services' and forgetting that the clients and the families have to be partners with the workers in accepting what is intended to be given. It is this interface between the health worker and the community which always remains wide and apart.

GRADES OF COMMUNITY PARTICIPATION

According to the dictionary 'participate' means 'have a share; take part in.' If the community will understand and appreciate the services provided by the health functionaries and avail of them fully at the proper time, one could consider that the community had participated well. If the community will provide any kind of assistance or support to the health functionaries physically, financially or materially, that will be a higher grade of community participation. If the community will own the programme and take responsibility for its planning, organization or immunization and also monitoring that will be a still higher grade of community participation and probably the best that one could think of.

STEPS FOR COMMUNITY ORGANIZATION AND INVOLVEMENT

To achieve such community participation, the health functionaries have to follow a common sense approach of knowing the people, identifying themselves with them and discussing informally on all matters of topical interest and giving them adequate information about the services available and being offered. Rapport-building and free-mixing are the key stones for community organization.

According to Kelman, there are three stages of learning--by compliance, by imitation and by internalization. It is the process of internalization which brings about sustained behavior, and not the other two. The health functionaries must discuss very thoroughly with individuals and groups so that the internalization takes place. While discussing and explaining the health needs, there are three important principles which the health worker must know and practice. (These principles are enunciated by Rosenstock). Firstly, the

learner or the client should be able to perceive the susceptibility of the possibility of his or her being affected. Secondly, the person should be able to know the severity of the problem or condition, and thirdly, the learner should be able to perceive the solution or remedy to the problem.

The strategy to be adopted for community organization is important. It is only through effective community organization that the highest degree of participation, namely of owning and taking responsibility by the community, can happen. For this, it has been found useful to have volunteers from the community or voluntary groups. The volunteer or voluntary group can be given training by workers to know what kind of responsibilities they can take and what kind of help they can give.

EXTENSION EDUCATION

Interpersonal communication with individual families and clients is necessary to gain confidence and to ensure continuity of action. However, in many situations, discussions in small groups which get collected on their own while the worker is doing home visits will prove more effective because of the peer group support and free flow of communication from different individuals.

The methodologies for extension education are not difficult and do not call for any special skill or talent. But the difficulty generally observed is the lack of attitude and interest in the health workers. Sitting with the people and talking means a good bit of time. The workers in general do not have that attitude necessary for staying in the community for long hours and talking to the people. The other difficulty is that the workers do their visits at a time when the people are busy in the farm or in other occupations. The workers are not mentally prepared to be in the village when the community members are at leisure and in a relaxed mood.

Whenever the subject of extension education is discussed in academic groups there is a tendency to give undue importance to educational aids, their preparation, pretesting and standardization and so on. Good aids will, of course, be useful for communication. But as already mentioned, it is the attitude and interest of the workers to share with the people which is much more important and lacking at present. First of all the workers have themselves to participate with the community; only then can they expect the community to participate with them. If they develop a taste (or attitude) for spending time with the people, gradually they will start enjoying the experience.

If every bit of information is shared with the community, planning, implementing and monitoring will also flow from the community. When doing surveys to collect information on eligible couples, antenatal cases, newborns, etc., the health functionaries can take a few volunteers along with them. This itself will be an educational effort.

Later the information of eligible couples, acceptors, antenatal risk cases, newborn risk cases, need for hospitalization for delivery, etc., can be discussed with the volunteers as well as the people in groups. They will then take responsibility for follow-up action and give group support for taking correct decisions.

Since most of the deliveries are conducted at home by relatives, they can be trained to do aseptic midwifery and supplied with pre-sterilized midwifery kits. They should not refuse to use them once they have understood the importance of asepsis.

The responsibilities which volunteers or voluntary group (like Mahila Mandals, or youth clubs) can take to participate in the F.W. services are listed below:

PROGRAMME ACTIVITIES OF HEALTH FUNCTIONARIES	HOW THE VOLUNTEERS CAN SHARE RESPONSIBILITY
1. Vital Statistics	
Birth rate, death rate, Infant mortality rate.	Gathering information and reporting monthly.
2. Family Welfare	1. Updating E.C. registers a. Informing about new couples b. Informing about couples who have left.
	2. Motivation
	3. Follow-up of acceptors
	4. Distribution of contraceptives
	5. Helping in educational programmes; group talks, film shows, etc.
3. MCH: Antenatal care	1. Helping in registration.
	2. Helping in antenatal check up in village or in subcentre.
	3. Educating high risk cases to go to PHC or hospital for check up and for delivery.
	4. Helping in T.T. administration.
	5. Distribution of tablets.
Natal care	1. Ensuring delivery in skilled hands.
	2. Ensuring delivery in hospital for high risk cases.

	Post-natal care	1. Follow-up of post-natal women as advised by health worker.
	Infant care	1. Ensuring colostrum for baby.
		2. Registration of infant and weighing.
		3. Watching the growth of the infant and attending to feeding.
		4. Helping when child get infection.
		5. Getting the children immunized.
	Minor ailments & first aid	Elementary first aid in case of emergencies and immediate referral.
		Treating diarrheas in children with O.R.T.
4.	Special health condition like leprosy, tuberculosis, filariasis, mental illness, heart disease, diabetes, cancer, etc.	Suspecting cases and referring to the Health Worker.
5.	Nutrition	Helping in nutrition demonstrations. Educating mothers about proper diet for mother and children.

Quality of Services Provided by Subcenter for Family Welfare

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It is estimated that each year at least half a million women die from causes related to pregnancy and childbirth. Over 99% of the maternal deaths take place in developing countries, which account for 86% of the world's births. In the poorest countries of the world, when a woman becomes pregnant, her chances of dying as a result are between 100 and 200 times higher than those of a pregnant woman of affluent countries.

In India, women in the reproductive age groups and young children contribute about 62% of the population. These groups of the population are also regarded as most vulnerable because of special health problems. Despite our efforts over the last 35 years, the attention given to pregnant mothers, to mothers postnatally and to children has not been adequate to reduce mortality and morbidity.

India has a very high maternal mortality (500-800/100,000 live births) and infant mortality (100-110/1000 live births). The average woman in India can expect to have around 5 to 6 live births and may have 7 to 8 pregnancies. Her lifetime chance of dying from pregnancy related causes is about 1 in 20. Some of the important causes of maternal mortality are sepsis, hemorrhage, toxaemia, illegal abortion, malnutrition and repeated childbirths. The important causes of deaths among infants and young children are prematurity, tetanus neonatorum, diarrhoea, malnutrition and respiratory infections. Several factors, such as inadequate care of mothers at risk, poor maternal health, lack of referral services, etc., contribute to this mortality.

Apart from the above causes of mortality and morbidity, there are many operational aspects in the delivery of health services which further affects the family welfare services, especially in the rural areas.

India is divided into 24 major states and 7 smaller union territories, which in turn are divided into administrative districts. At present there are 431 districts. Each district is divided into subdistricts or taluks, under which are situated the community development blocks. There are about 6000 community blocks in the country, where exists a primary health center (PHC). The most peripheral health institutional facility is at subcenter, manned by one male and one female multipurpose health worker (M.P.W.). At present, in most places there is one subcenter per 5000 to 8000 or more population. It is, however, aimed to have one subcenter per 5000 population (3000 population in hilly and desert areas and difficult terrain). To date, about 85,000 subcenters have been established in the country.

Based on the existing reports and studies, the quality of services provided by subcenters towards family welfare programme are not as satisfactory as desired. Some of the reasons for poor quality services through a subcenter are as follows: difficult terrain, poor communication facilities, lack of transport for health personnel, under-utilization of services because

of woefully meager awareness of the importance of health services, limited resources, improper and lack of repeated training to health personnel, lack of managerial skills and lastly, the different aspect of community life in the rural population.

FINDINGS OF THE WORKSHOP ON M.C.H. SERVICES AT SUBCENTER LEVEL UNDER DANIDA PROJECT AREA

* Knowledge of the female multipurpose worker is poorer than expected.

* Female multipurpose worker does not use her kit during field visits.

* Female M.P.W. does not visit all the villages regularly and does not visit some villages at all because they are not approachable.

* Antenatal care through subcenters are roughly 15 to 20 percent, and intranatal and postnatal services are also poor.

* Participation of male worker in M.C.H. services is very minimum. They understand that the responsibility of providing M.C.H. services lies with the female worker.

* Multipurpose supervisors' knowledge is the same as that of male and female M.P.W.s so they are not in a position to check work and train them in field situations. Supervision by them is irregular.

* Medical officers did not visit the subcenters, nor are they interested in national health programmes other than family planning. Moreover B.M.O. does not have adequate administrative powers to take action against workers, who are slack or defaulting.

* Information education communication (I.E.C.) material supplied to P.H.C. is not utilized usually at subcenters.

* Orientation training camps are organized in a great hurry by district health officers (D.H.O's). There is no responsibility of fixing the date and site of camp on the block medical officers.

* Health education posters are usually made for the literate. Illiterate persons are not able to understand messages provided by the posters.

* The community is not aware of the services available to them. They do not know why they should utilize these services. There is a wide gap between the health worker and the community and they are not participating in the programme.

FINDINGS OF THE STUDY "AN EVALUATION OF OPERATIONAL ACTIVITIES OF FAMILY WELFARE PROGRAMME IN THE P.H.C's OF GWALIOR AND CHAMBAL DIVISIONS OF MADHYA PRADESH"

(1) The reliability of the programme service statistics is not satisfactory. Nearly 10% of the entries in the records were found wrong on verification. In addition 2.5% of the entries in case of sterilization, 16% in case of

I.U.D's and 23% of the entries in case of oral pills were of doubtful nature as the acceptors of respective names and addresses could not be traced in the respective villages. Similarly 10-15% of entries in the case of vaccinations were found wrong on verification.

(2) Failure rate of laparoscopic sterilization and I.U.D. was 6.2% and 17% respectively.

(3) Follow-up of the acceptors of the programme has been found to be very poor. It was observed that 56.5% of sterilized cases, 23.9% of I.U.D. cases, 66.3% of condom users and 40.8% of oral pills acceptors were not followed at all.

(4) Regarding the stay of health worker at the health headquarters (subcenters) it was found that only 14% of the health workers are living at their headquarters, while the rest are visiting according to their convenience. An attempt was further made to verify the presence of health workers in the field, and it was found that only 42.4% workers were found present at the time of the visit of the team.

It may, therefore, be concluded that poor quality of the programme statistics, poor follow-up of acceptors, high absentee rate of the health workers from their headquarters and lack of community awareness and involvement are the factors which are largely responsible for the poor performance of the family welfare programme.

Following are a few suggestions/recommendations towards improving the quality of services provided through a subcenter for Family Welfare activities as per a workshop recently held during National Conference of I.A.P.S.M. at Gwalior.

(1) General recommendation,

(2) Towards a good coverage of activities,

(3) Minimum care at subcenter level,

(4) Risk approach and referral services,

(5) Training of workers,

(6) Community participation, and

(7) Other recommendations.

(1) GENERAL RECOMMENDATION

Workshop strongly recommended improvement of management skills in the medical and para-medical staff with special reference to knowledge, attitude, development, motivation, supervision and monitoring.

(2) GOOD COVERAGE OF ACTIVITIES

(i) Workshop recommended that the preparation of daily work/tour plan should be done at PHC with participation of the medical officer, block extension educator, supervisor and worker.

(ii) Tour programme should be posted on notice board and office of block medical officer, at subcenter as well as in each village wall so that everyone in PHC knows when the worker is visiting the village.

(iii) Tour programme is to be setup in such a way that both male and female worker visit a village on the same day.

(iv) There should be correct work planning. A worker should work out his own target on the basis of village problem and provide services according to that. They should not work according to targets given centrally by the government in respect to all programmes and M.C.H.

(v) Unapproachable village should be covered by four team members (2 supervisors and 2 M.P.W.s), at least once a month. Medical officer should check implementation of plan during monthly meeting as well as a surprise check.

(vi) Health workers should show their registers to villagers and inform them about village problems as well family problems so that villagers can motivate their family for acceptance of services.

(vii) Workers may identify 3-4 informants in each village and give responsibility of some families to them. They will give back information to M.P.W. on their visit, like antenatal case, child birth, death, immunization problem, so that worker need not visit each house every time.

(viii) A.N.M. should know within 48-72 hours about each birth which will require good liaison between dai and worker.

(ix) All the national health programmes should be treated equally. More attention should not be given to family planning even in family planning to sterilization.

(X) DANIDA Project management should supply pre-sterilized delivery kit to each M.P.W. and dai. It will be better to supply this kit to antenatal mothers so that this can be used at time of delivery.

(3) MINIMUM CARE WE EXPECT AT SUBCENTER IN RELATION TO M.C.H.

(i) Workshop recommended that each antenatal mother should be registered. A worker should know about their expected target.

(ii) Detailed history of patients is to be taken immediately after registration so that the worker can identify high risk cases. This needs sufficient educational training of workers.

(iii) Urine examination, haemoglobin and weight record must be done at subcenter during antenatal clinic.

(iv) Immunization of pregnant mother with 2 doses of T.T. and a supply of iron and folic acid tablets for 3 months at a time.

(v) Iron and folic acid tablets to children and vitamin-A solution to children.

(vi) Immunization of each child at the appropriate time after birth. The infant should be followed for immunization.

(4) RISK APPROACH AND REFERRAL SERVICES

(i) Workshop strongly recommended preparation of posters that should show high risk mother and children. That should be posted on wall of subcenter so that ANM will be constantly reminded about high risk cases and also to educate the public.

(ii) High risk mothers who require hospital delivery should be admitted to hospital 2-3 days before expected date of delivery.

(iii) Referral system has to be established. A referral card system is to be developed and this card should constantly be supplied by DANIDA project management.

(iv) A list of high risk cases is to be printed on back of the referral card.

(v) Training of workers in the use of referral card and detection of high risk case is to be done in P.S.M. Department of G.R. Medical College.

(5) TRAINING OF WORKERS

(I) Medical Officer: Medical officer should be trained at P.S.M. Department for implementation of national health programme at least one week in every year.

(II) Supervisor:

(i) Training must be practical field oriented rather than class room training. At least three months field training should be done before promotion.

(ii) Medical officer and B.E.E. should refresh their knowledge from time to time during supervision.

(III) M.P.W.:

(i) New recruitment training must be done at PHC level and that should be done mainly through field orientation training.

(ii) There should be on the spot refreshing of knowledge of female M.P.W. at the time of supervision by medical

officer/block extension educator as well during monthly and sector meeting.

(iii) Examination of new recruited worker should be through practical oriented questions.

(IV) V.H.G. AND DAI:

V.H.G. and dai should be oriented about their work at least five days every three months.

(V) Training Tutor:

Refresher training of tutor of training school should be organized and it should be practical training.

(6) COMMUNITY PARTICIPATION

(i) Worker should spend time in informal group in village to explain to the mother the need and importance of care during pregnancy, child birth and infant care, etc., and provide information on services available. Community should be fully aware about workers visit in the village. There should be special attention paid to high risk mothers and to their families to explain the need for timely action in reaching the place of delivery.

(ii) The family planning worker should encourage the community to take responsibility to develop their own programme. For that situation with regards to existing family planning aspect should be made known to people and they should appreciate as a whole group which family is to be exhorted to accept method of contraception. Community should make full use of spreading the message and giving their experience to motivate people.

(iii) The mother should also be able to understand about prevention of disease in children and mother. If any death took place, there should be discussion in the group as to why this happened and how it can be prevented. This discussion is to be done in the presence of the M.P.W.

(iv) It is essential and useful to have volunteers in the community and give them some training in this aspect so that they will not only function as an agent in the community but also lessen the work of the female M.P.W. and provide information and support at the time of her visit in the village.

(v) Interpersonal communication is much more important and relevant than mass meeting and use of audiovisual aids.

(7) OTHER RECOMMENDATIONS

(i) Medical officer and supervisor must pay regular visits to subcenter and supervise working pattern of M.P.W.

(ii) Block extension educator should devote maximum time on training and reorientation of worker.

(iii) Registration of infant should be a continuous process; it should not be done on a fixed month of the year. There should be the same register for infants and for immunization.

(iv) O.T. camp strategy is to be changed. There should be flexibility to use money as well as to organize O.T. camp.

(v) Community must know that dai is not a Government servant; she should get compliments from community.

(vi) There should not be rigidity in working time of worker; it should be modified according to the availability of the villager in the houses.

(vii) All administrative power to be given to block medical officer.

Most maternal and infant deaths are preventable provided M.C.H. and family planning programme are given equal status and importance supported by I.E.C. activities for demand generation and community participation at subcenter level.